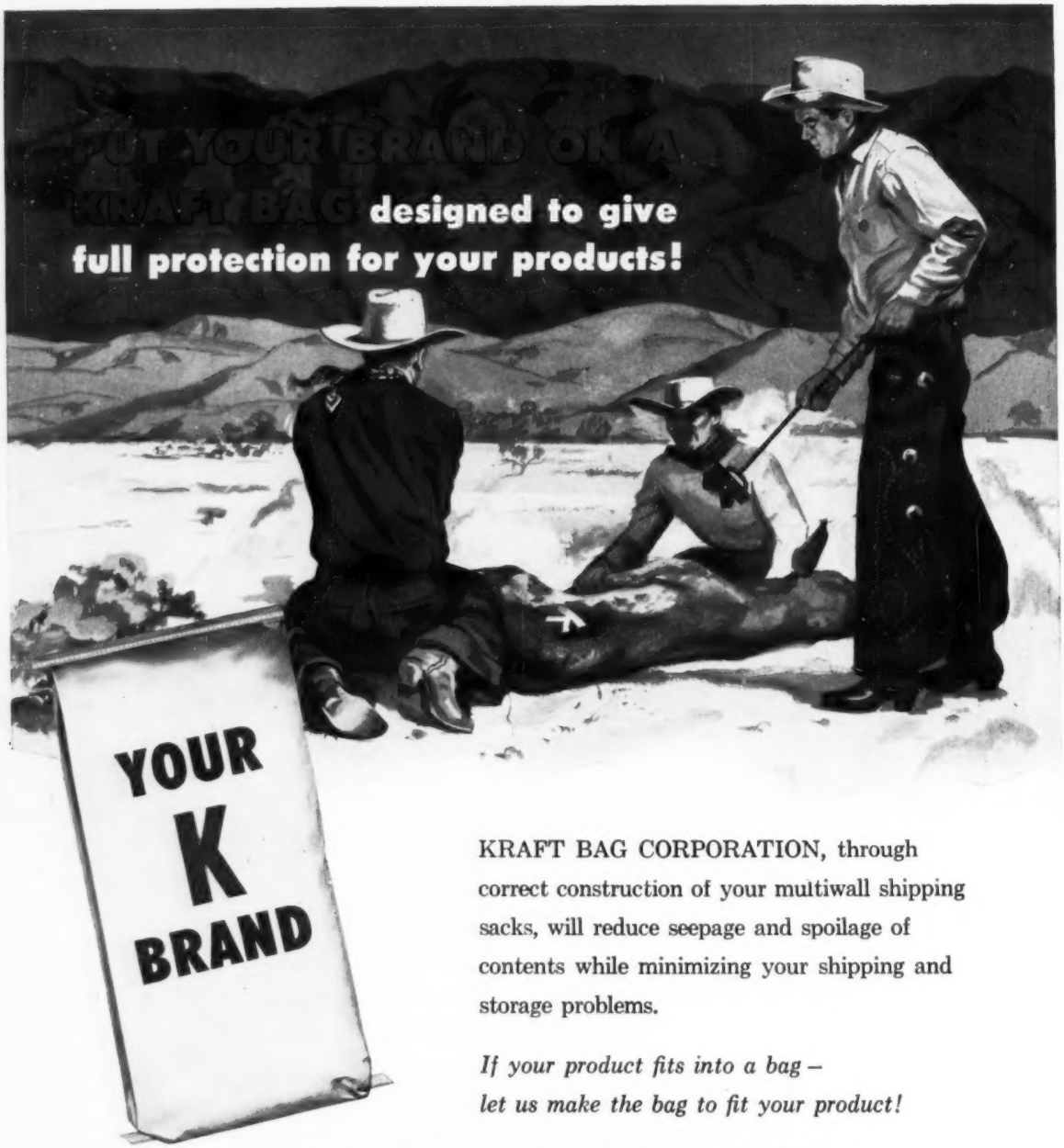
AUGUST, 1959

Commercial Fertilizer

and PLANT FOOD INDUSTRY



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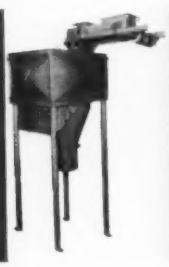

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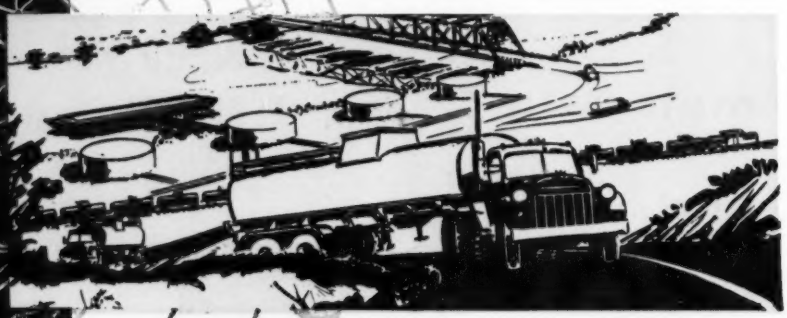

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Commenting Freely

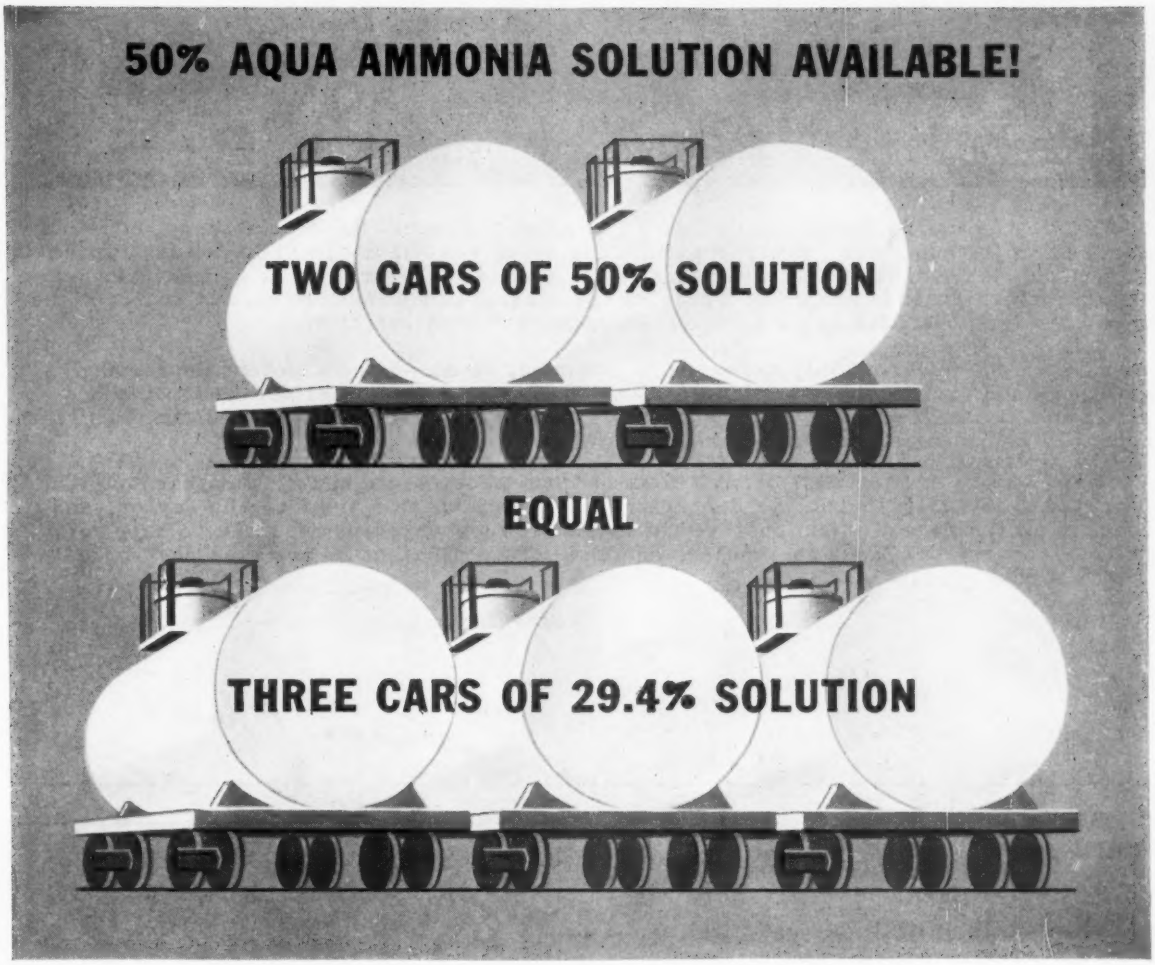
by BRUCE MORAN

A sign that should be encouraging to all of us in the fertilizer industry is the fact that NPFI's Fertilizer Salesman's Handbook has gone into its third printing. We, who have long preached the need for more training down the line, see this as a pretty big straw in the wind.

It is a fine thing to know that local fertilizer schools, all over the country, are supplying basic ammunition by which our salesmen can really indoctrinate the farmer in the religion of adequate plant food.

The program, now in progress for several years, by which NPFI is getting to local levels the data prepared by the local Land Grant Colleges, showing how much more money each crop could yield if properly fertilized - is another big step in the right direction.

And as the yeast of ag school alumni takes hold on the farm itself - and displaces grandpop's rule of thumb, dark-of-the-moon methods - there is hope that we will find our industry further expanding capacity, to meet the demand that is sure to come.



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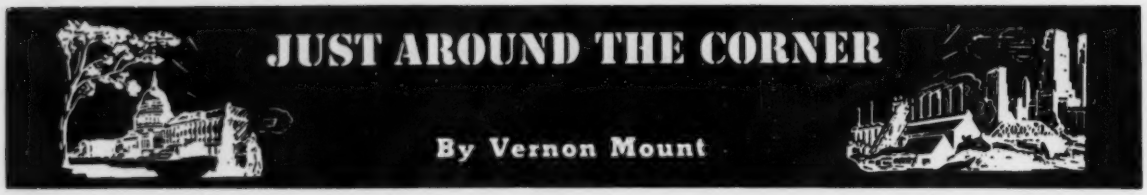


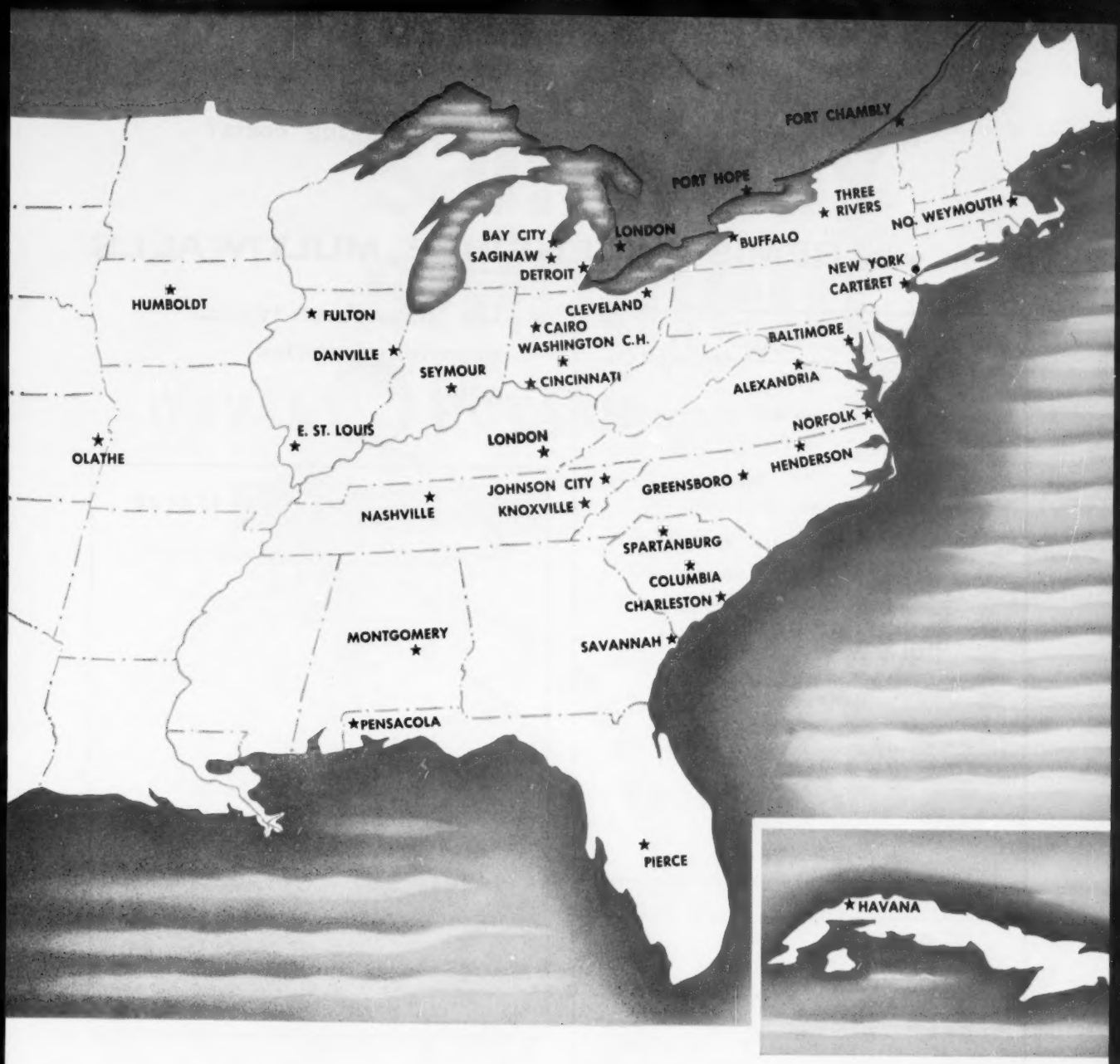
AS WE SAID the Castro situation in Cuba is of major concern. He has the secret of making the most of catastrophe. Every pressure the other way helps him tighten his grip, increases the loyalty of the great masses who are his followers. If he is indeed as Red as it seems, Washington has as great a problem as, several months ago, we said it would. Either way, American interests in Cuba are in real danger. Stay out of Cuba!

AS WE SAID you will probably never again, short of an all-out and severe depression, get goods and equipment for as little as they now cost. The steel strike is only one straw on the camel's back. Every economic force is helping push. The President is like Horatius, standing alone at the bridge.

AS WE SAID there are screams, political in nature, about waste and mismanagement in the Department of Agriculture. The fertilizer industry, which – next to the farmer, and because of the farmer – has most to gain, should do everything possible to help set the newspapers, the local politicians and the voters straight on the real powerhouse the USDA really is.

Yours faithfully,

Vernon Mount



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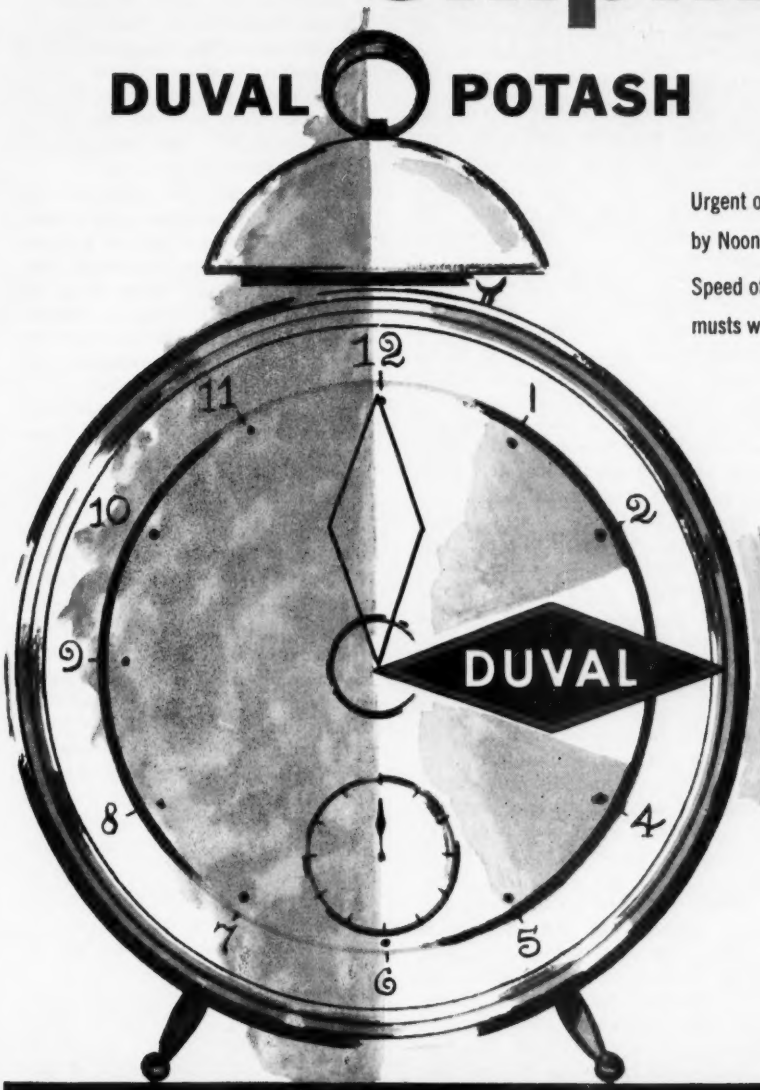

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You know pC and pH

Here comes G

We found this fascinating and impish discussion in "Fertiliser News," published by the Fertiliser Association of India. But they in turn lifted it form "The Grower" of August 1957. So it has been around. But we cannot resist publishing it because it represents a viewpoint not often stated, and perhaps not entirely fair to the agronomist. Anyhow—read it and grin. Then think it over; it may start a new train of thought for you.

By Hugh Nichol
Chemistry Department,
West of Scotland Agricultural College

Like the weather, balance of fertilisers is something everybody concerned talks about while nobody quite knows what is to be done about it. What is balance?

The ideas set out in textbooks come to little more than recommendations that along with nitrogen there ought to be potash, or vice versa; and some phosphorus with both. Amounts or portions to be taken are decided by fancy more than by scientific teachings. Potassium fertilisers became common towards the end of last century; ideas about balance in fertilisers are thus about 70 years old. The main trouble with them today is not age but senility.

If they had been born of healthy parents (that is, if they had been thought out on a sound basis) they could now be respected for their grey hairs and accompanying wisdom. Unfortunately, though ideas of balance are so old that they seem to have always been with us, they have remained childlike and sterile while ideas in other sciences have grown up and produced vigorous offspring able to help in the house. To drop the metaphor: balance as customarily understood is taught as a set of prescriptions derived from experience without scientific foundation.

The knowledge on which recommendations about balance are normally given today is experience that such-and-such mixtures are good for crops; that is to say, after a known mixture or substance has been applied to soil it can be expected to produce good growth or yield. That sort of thing is empiricism, and shows lack of scientific curiosity about the intermediate stages between fertiliser and crop.

What does happen when fertiliser is added to soil (or to a water-culture or the like)? Before that can be discussed, we must take a tip from the Frog Footman when Alice, in Wonderland, asked how she was to get into the house. He replied: "Are you to get in at all? That's the first question, you know."

For many years the first question about fertilisers was not asked. Everyone assumed that fertilisers were things which acted as sources of nitrogen, phosphoric acid, and potash for plants; some of them admittedly had side-effects like making soil acid—but those awkward facts came to be lectured about separately from the nutrient functions of NPK.

In 1923, K. Bondorff, a Dane, pointed out the first fact about fertilisers: namely, that being salts, they produce definite salt-effects. Instead of being accepted for the fundamental fact it is, this aroused much argument which slowly died away as the fertiliser chemists managed to forget the idea which had disturbed their preoccupation with NPK as nutrient. Then trace elements came in; and the only partly awakened agronomists and horticultural chemists went comfortably to sleep with the new brood of nutrients.

People talk and write about calcium phosphates and potassium chloride and the rest as if it was meant to regard them as salts; but it has become the custom to ignore first things whenever effects of fertilisers are being discussed. Thus, in a potash salt only the K has any value (being the only part of the salt that is credited with a nutrient effect); in a calcium phosphate only the P; and so on. This unchemical nonsense is so widespread that it may be called universal; indeed, it is exceptional to read of a field trial of phosphate fertilisers which takes account of the effects—nutrient or other—of the calcium or other base; and in a century of superphosphate there seem to have been only two attempts at investigating the effects (other than of the sulphate as nutrient) of the gypsum or calcium sulphate which makes up half of that enormously important fertiliser.

The pure or mixed salts in fertilisers consist of two parts; e.g., potassium/chloride, sodium/nitrate, ammonium/phosphate, also calcium/sulphate. When a salt is dissolved in water—as when a fertiliser dissolves in the soil moisture—it splits up into these parts: scientifically called cation (better known, perhaps, as a "base" like calcium) and anion (the other or "acid" part). Soil organic matter and clay, though insoluble, often take on the job of anion along with the salts natural to soil or added to it.

The situation in fertilised or unfertilised soil is certainly very complex; but if we look only at a water extract made, for convenience, from about two parts of water to one of soil by weight, the study is simplified by the circumstance that the net result of all the inter-actions between colloids and salts of every kind is that the anions and cations are in the ratio, by weight, of about 2.4 to 1.

That is for a soil of the kinds commonly cropped in Britain and Western Europe. This interesting and valuable result was noted by my colleague, Mr. E. K. Schofield-Palmer. He also noted that the anion and cation of calcium sulphate have the same weight-ratio. So gypsum can be taken as the model substance for discussing cation-anion or ionic balance in soils. Those two ideas are based on fundamental principles. Once they are accepted, a number of consequences follow.

If a European soil of the sort on which agriculture and horticulture have been pursued for a couple of thousand years is taken as normal, it must be in balance—or wild or cultivated plants would not have grown on it before fertilisers were introduced. If the anion-cation ratio differs much from 2.4, the soil is either naturally "abnormal" by our standards—like the "alkali" soils of hot countries—or it has been made abnormal by injudicious fertilising. That denotes a start. At the least, we can henceforth express "balance" in figures by finding the ratio by weight of anion ot cation in any soil, fertilised or not. At Glasgow we call that ratio G.

By seeing whether G is near or greatly different from 2.4, it can be said that the soil is about, or not nearly in balance—as far as the cations and anions go. However, G ex-

presses only the chemical or "calcium-sulphate" balance. It tells nothing about other important things, such as degree of acidity and total effect of concentration of salts; but those are measurable by pH and pC. By combining pH and pC with an analysis for anions or cations (or by finding G by analysis) a great deal more knowledge about ionic balance in the soil can be obtained. This would require many pages to explain: some of it has been set out in Fertiliser Society Proceeding No. 39 (1956), Manuring of Greenhouse Crops, and more is being published.

At Glasgow we are gratified that the pC notation introduced by my colleague Dr. C. L. Whittles has been widely adopted in England. Nevertheless, we hope that growers and advisers will not stick at looking on pC as nothing more than an index of salinity. I have tried to suggest in this brief outline that considerable advances are possible by regarding fertilisers in the light of chemical facts: as by combining pC-values with other information easily obtainable.

The weight relationships of the ions of common fertiliser salts alone suggest a collection of interesting consequences. The lightest ion commonly employed is ammonium; are there not new horticultural roles, at least, for lithium? Again: if much ammonium was released by the normal processes of decomposition in soil, or if much ammonium fertiliser (say, the chloride) with a low G value were given, the soil solution would thereby become unbalanced. Base exchange ensures that ammonium is adsorbed by the colloids unless it is in great excess; nitrification also removes ammonia or ammonium by converting it into nitrate, which is a heavy ion able to assist in restoring balance.

Another important deduction is that it is incorrect to regard nitrate and ammonium as having the same value per unit weight of nitrogen. The symbol N cannot be used without discrimination for both ions, since their effects on balance are opposite. Chemically, the difference between nitrate and ammonium is obvious. That such obvious differences, along with other facts apparent to a student of elementary chemistry, have been allowed to drop from notice by practically everyone concerned with fertiliser chemistry and use of fertilisers is perhaps the most serious drawback resulting from the traditional beliefs summed up in the symbols NPK.

More about ionic relationships in soil

G for Gypsum

by Dr. Vincent Sauchelli
Chemical Technologist
National Plant Food Institute

What happens, chemically, when fertilizer is mixed with soil, or placed in a water culture or dissolved in water as in fluid fertilizers? It splits up into parts called ions, which are further differentiated into cations carrying a positive charge of electricity and anions, with a negative charge. The action is called ionization. For example, sodium nitrate in solution yields sodium $(Na)+$ and nitrate $(NO_3)-$ ions. Fertilizers are, in the language of chemistry, "salts," consisting of one part called the base (the cation) and one part, the acid (anion). This is elementary chemistry, of course; and yet, how strange that so many who should and do know better, ignore this simple fact.

It was K. Bondorff, a Dane, who back in 1923 pointed out that fertilizers, being salts, would produce **salt effects** in the soil solution. Dr. Hugh Nicol, a noted British scientist, has in recent years been arousing interest in these same salt effects[1] by stressing they are of fundamental significance in a proper understanding of how fertilizer acts to feed plant life. His numerous contributions on the subject point up the logical consequences of the biological effects of the ions of a salt and how prevalent among agricultural workers are the misapprehensions about such ionic effects. A brief digest of some of Dr. Nicol's comments follow:

In most of the general discussions of fertilizers it is more usual to refer to the nutrient elements N, P, K, rather than to the totality of the chemical components; that is, to the anions as well as the cations. The anions seem to be disregarded. (In this connection the phosphatic anions $(H_2PO_4)-$ and (HPO4)-- are excepted.) The main emphasis is generally on the N, P, K nutrient elements; sometimes, secondary and micro-nutrients may be included. This practice is indefensible in view of the known effects which the chemical partners of the nutrient triad (the anions) create in the soil solution. It must be remembered that when a fertilizer compound is put into the soil to improve crop growth two functions operate: a nutrient function resulting from the effect of the N, P, K, and other cationic factors; and a saline or anionic function due to the presence of the negatively charged ions. The fertilizer ions enter into a complicated chemical relationship with ions already present in the soil solution and on the colloidal complex of the soil.

An example may help to visualize the action: When normal superphosphate is placed in a soil it ionizes and the calcium phosphate portion yields calcium $(Ca)++$ and $(H_2PO_4)-$, $(HPO_4)--$ ions. The gypsum or calcium sulfate portion of the superphosphate also ionizes to yield $(Ca)++$ and $(So_4)--$ ions. Ammonium/sulfate in a soil yields $(NH)+$ and $(SO_4)--$ ions. Muriate of potash yields $(K)+$ and $(Cl)-$ ions. Now it would be just as wrong to interpret field responses from sulfate of ammonia by sole reference to its $(SO_4)--$ ions as it is to attribute all its effects to the $(NH_4)+$ ions. Similarly, it is wrong to credit responses to normal superphosphate exclusively to the phosphatic ions or to the calcium ions. Both kinds of ions are present and both exert their respective actions. Agronomists have to a large extent recognized this and in field tests to study phosphate effects now prefer to use triple super because it contains little or no calcium sulfate.

Furthermore, while scant consideration is given to the saline or anionic influences in soil reaction the physical effects of the combined ions are for the most part ignored or considered of no consequence. One result of this attitude is evident in the way liming is considered. Lime may supply either calcium or magnesium or both and to lime a soil is to furnish these nutrient elements as well as to affect the acidity. Liming is generally regarded as somewhat different from the application of calcium or magnesium in the form of chemical fertilizer. This is indeed strange. No two practices, that is, liming and fertilizing, could have a more identical function. Each is to furnish the soil with nutrients

[1] Proc. No. 39. The Fertilizer Society (London); Fert. & Feedstuffs, 1957, December 4 issue.

for improving crop growth. Certainly the effects of one practice cannot in reason be divorced from the effects of the other.

G and pH

Agricultural workers have a means for measuring the degree of acidity or the hydrogen ion concentration of the soil. This is expressed as the pH or the negative logarithm of the hydrogen ion concentration. Dr. Nicol believes, as a result of investigations at the West of Scotland Agricultural College conducted by Dr. C. L. Whittles, that it is necessary to measure also the electrical conductivity of the soil solution if one is to understand the nature of ionic balance. For this purpose, one needs to have a material point of departure, a referrent. This is provided by calcium sulfate or gypsum. Experiments have shown that calcium sulfate has an ionic balance so close to that found in humid agricultural soils of northwestern Europe that it can serve as the model salt. The ionic balance of salts in soil solution may be measured, by conductivity equipment, with reference to properties of calcium sulfate. It is calculated from proportions of ions or by taking account of chemical or electrical properties. Agreement with or deviation from the chemical balance of a neutral salt such as calcium sulfate can thus be measured whether in a natural water or in a water extract of soil treated or untreated with fertilizer or lime. The resultant solution may be regarded as in chemical or calcium-sulfate balance when the total cations and the total anions are in the same ratio by weight of 1:2.4. This is the ratio of these ions in calcium sulfate. This weight ratio can be represented by the capital letter G, the initial letter of gypsum, the common name for calcium sulfate.

If the G value of a soil solution deviates significantly from 2.4 that soil is considered either abnormal naturally or made so by faulty fertilization. The G ratio cannot indicate anything about the degree of acidity or of the effect of the concentration of salts. Electrical conductivity measurements will gauge the total effect of salt concentration just as pH gauges the degree of acidity. G involves the ratio of the totality of ions in the solution.

Any fertilizer may be considered as a single substance or as a compound of mixtures for these measurements. For example, the G value of muriate of potash (KCl) is 0.91. Compared with the G value of gypsum it is low and thus in a mixture it would tend to have a strong unbalancing effect. Dr. Nicol deduces from this that the chlorine anion (Cl)- should not of itself be condemned as toxic in a fertilizer, but instead that when muriate is used as a fertilizer its undesirable effects are to be attributed to its unbalancing effect. Sulfate of potash has a G value of 1.23 which is much better than that of muriate. Nitrate of potash (KNO_3) has a G value of 1.58 which is still better. G for nitrate of soda is 2.70. Hence, a mixture of nitrate of soda and muriate will give a better ionic balance than nitrate of potash alone. In all cases involving total effects of a fertilizer mixture, all the ions—cations and anions—are to be considered and not merely those usually regarded as having a nutrient value.

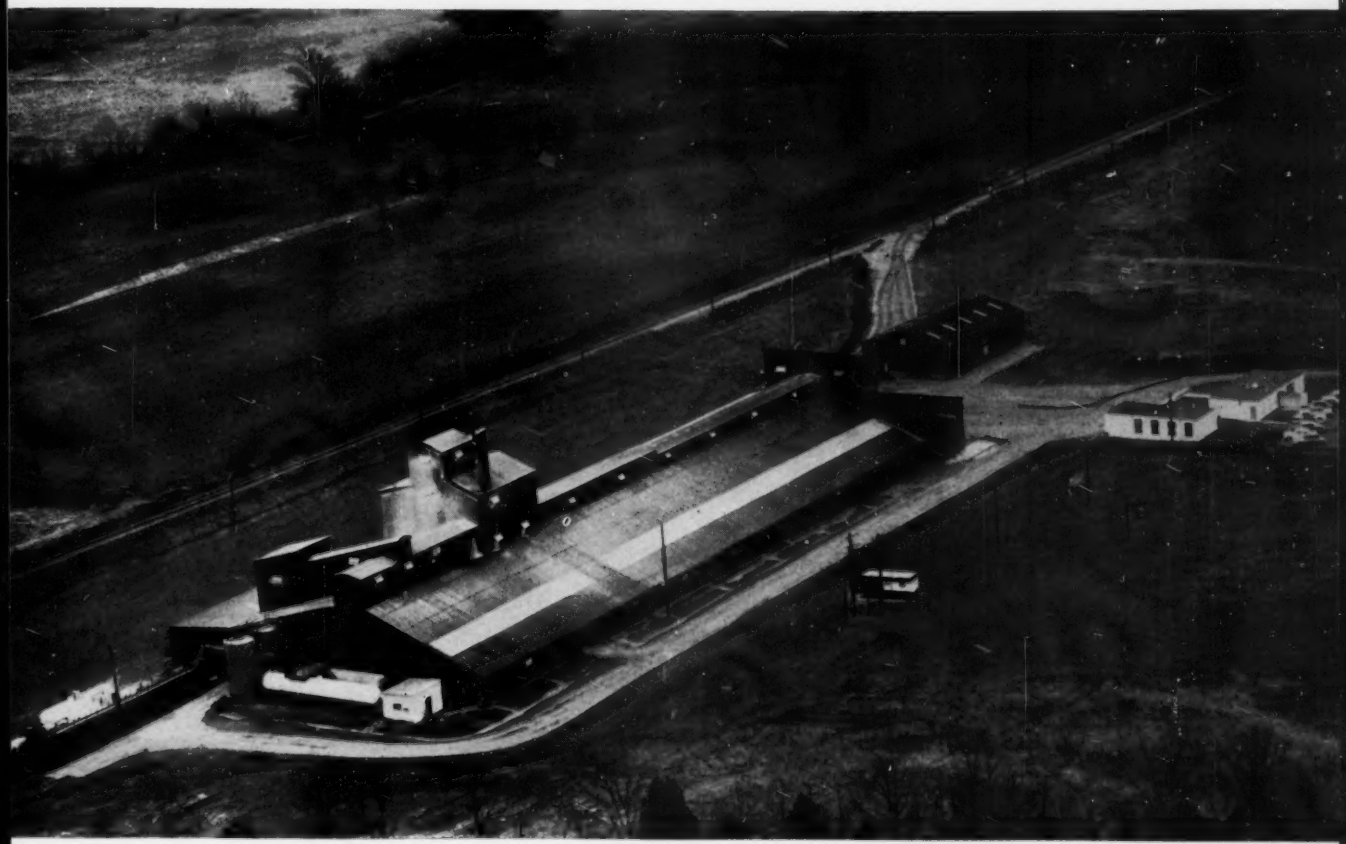
pH/pC Concept

Fertilizer salts exert a dual effect —nutrient and saline—in the soil solution, the one inseparable from the other. The G or anion-cation ratio is only one single expressison of the complete saline function with which are associated always the effects on soil reaction measured as pH and on electrical conductivity measured as pC. The pC value is expressed as the negative logarithm of the conductivity measured in mhos. The pH and pC measurements are to be made whenever fertilizer salts are involved having alkaline and acidic properties. Dr. Nicol suggests the equation $pL = 2pH - pC$ be used to measure this relationship.

More of these considerations will be given in future releases. Enough has been given perhaps to suggest that there is more to this problem of soil fertility and its relationship to crop growth than is provided by the oversimplified considerations usually accorded it even in agronomic circles.

Tree Farmers Increase Planting

The farming of trees is operated these days like any other crop. Pulp and lumber companies now cut large areas at one time, reseed quickly by helicopter. In 1951 nationwide planting of trees was less than 500,000 acres. Today in 11 Southern states alone this season has seen some 1,500,000 acres planted . . . and that is as many as the entire US planted last year. Soil bank conservation reserve payments, of course, encourage much planting on former farm acreage.



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The International Scene

AUSTRIA

Delivering More Fertilizer to Asia

Austria's markets for fertilizer seem to be shifting East. Their deliveries last year to Asian countries accounted for more than half of last year's exports. European deliveries were down to 37% and to Africa were down to 10%.

BRITAIN

Subsidizes Summer Liming

The subsidy on lime delivered on the 11th of May and thereafter until further notice has been increased to 70% of the farmers liming costs, which includes application as well as the lime itself. This from a joint announcement of the Agricultural Departments in Great Britain.

CANADA

Also Gains in Asia

Fertilizer exports from Canada for 1958 went to Asian markets in 1958 to the extent of $1,511,000 to the Philippines and Korea. Canadian trade with the United Kingdom shows up as one of the bright spots of the entire UK chemical trade.

CHILE

Nitrate Production

1.3 million tons

The production of nitrate in Chile for the period July 1958 to June 1959, at an average price of $30 per ton, is expected to total some 11,300,000 tons.

COSTA RICA

Frees Fertilizer Imports

The 10% duty on natural and manufactured fertilizers imported into Costa Rica, now come in duty free. This includes a wide, specified range of plant foods—organic, nitrates, phosphates, phosphatic fertilizers, potassic fertilizers and materials except crude salts, mixed fertilizers, trace elements. The Government will make sure that prices are reduced accordingly, by the establishment of maximum profits for all hands down the line.

EGYPT

1960 Target for Aswan Plant

The ammonium nitrate plant under construction at Aswan is now slated for 1960 completion, according to directors of United Arab Republic's Economic Development Organization. Power for the plant will be generated at Aswan dam, beginning next December. Annual output of the plant will be 380,000 tons of ammonium nitrate, but expanded power facilities will increase this to 480,000 tons a year by 1961.

GERMANY

Proves Fertilizer Value

The farm structure of German territory ceded to Poland after World War 1 has remained virtually unchanged, except in one respect—the use of fertilizer. Since the land went over to Communist Poland, the yields have fallen to levels comparable with the adjacent Polish farm areas.

Prewar fertilizer use was more than 5 times what it is now.

INDIA

Superphosphate Below Capacity

India now has 14 superphosphate plants with a total of 340,000 tons annual capacity, but 1958 production amounted to only 157,300 tons, Foreign exchange restrictions, barring imports of raw materials, are blamed for this situation. The estimated need is 300,000 tons.

ITALY

Weather Blocks Fertilizer Sales

Adverse weather, which has cut agricultural income, is said partly to explain the small increase in consumption of N and K fertilizers. P fertilizer sales declined, and it was explained that slow depletion rates account for less re-fertilization.

LEBANON

Raise Import Duty

Superphosphates which have come into Lebanon duty free are now taxed at 15%. The classification, more exactly, reads: Phosphated mineral or chemical fertilizers: a) Superphosphate, 15%; b) other, free.

MEXICO

Takes Over Phosphate Areas

Control of the phosphate deposits of Lower California has been taken over by the Mexican Government. This may foreshadow the use of local materials in such plants as the Government's own Guanos y Fertilizantes plant, which has been a big importer.

Sets Up Ammonia Monopoly

Odds favor speedy passage of a bill introduced to the Mexican Congress recently that would reserve ammonia, among a number of other petrochemicals, for production only by the government-owned oil monopoly, Petroleos Mexicanos (Pemex). Financing in excess of $100,000,000 has already been arranged for a dozen projects in the government's petrochemical development.

SWEDEN

Domestic Market Off

Stockholms Superfosfat Fabriks AB, chemical and fertilizer manufacturer, reported to stockholders that total value of sales in 1958 increased nearly 4%, despite heavy international competition which forced price levels down on many products. Although principally interested in the domestic market in the past, the firm was pushed into export markets by weakness in domestic demand for fertilizers; export sales were up about 11% in 1958, with 30% of their output going abroad.

TUNISIA

Big Rock Increases

Production and exports of phosphate rock in Tunisia were 2,278,532 and 1,966,488 metric tons, respectively, in 1958, increases of 10 percent in production and 16 percent in exports over those in the preceding year. France and Italy, the major destinations for the exports, accounted for 60 percent of the total.

HONORS

American Potash Institute has sent out an entertainingly written booklet about Hugh H. Bennett, "father of soil conservation." Some idea of the contents may be gleaned from this covering letter:

"This deals with a leader of American agriculture who was 47 years old before he could get anyone to heed his warnings. A man who gave 50 years of his life urging the world to conserve its soil and water.

"He was cheered. He was cursed. He was laughed at. He was even betrayed. But he moved forward, up the gullies, at all times.

"And out of his warnings grew the modern U. S. Soil Conservation Service, and the soil conservation idea of nearly 50 other nations."

The little booklet is entitled "And History is Already Shining on Him" and was written by Santford Martin, API editor.

* * *

Francis A. Gunther, insect toxicologist of the University of California, Riverside, has been selected to receive the 1959 Harvey W. Wiley award of the Association of Official Agricultural Chemists. This $500 award was established in 1956 to honor the father of the original Pure Food and Drug Law and a founder of the Association, and is presented annually to a scientist who makes an outstanding contribution to the development of methods for the analysis of foods, drugs, cosmetics, feeds, fertilizers, or pesticides, or for use in general analytical chemistry.

The announcement was made by Dr. A. H. Robertson, director, N. Y. State Food Laboratory, who is president of AOAC.

* * *

Karl Robert Kern, assistant editor, Information Service, Iowa State, has been awarded the Agricultural Communications Award sponsored by the American Association of Agricultural College Editors and NPFI. The presentation was made at a special University of Florida luncheon ceremony, and NPFI's Louis Wilson presented the scroll and a check for $500 to be used for advanced professional training in agricultural communications.

Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 8

HERE ARE 12 WAYS THE PRE-REACTOR PAYS!

MAJOR ADVANTAGES OF NEW TECHNIQUE

The new pre-reactor process for producing high-analysis, high-nitrogen mixed fertilizers is rapidly gaining in popularity because it offers so many outstanding advantages. Here are only a few of the many benefits fertilizer manufacturers obtain by incorporating a pre-reactor in a normal high-analysis manufacturing operation:

1 Low-cost Nitrogen

Produce such grades as 16-8-8, 16-4-8, 15-10-10, 12-12-12, and 14-0-14 with *all* the nitrogen derived at low cost from ARCADIAN® Nitrogen Solutions.

2 Accurate Formulation

Put exactly enough nitrogen into high-analysis fertilizers to meet minimum guarantees, without resorting to excessive formulation.

3 Less Loss of Nitrogen

Manufacture high-quality granular fertilizers with a recovery of 97 to 98% of nitrogen input.

4 Efficient Use of Acids

Neutralize ammoniating solutions with sulfuric acid, without using the excess amounts of acid often needed in conventional equipment. Provide more intimate contact of phosphoric acid with ammoniating solution.

5 Better Ammoniation

Get high ammoniation rates by ammoniating dry superphosphate before combining with nitrogen slurry from pre-reactor.

6 Savings in Handling

Eliminate costs of handling dry materials and unavoidable losses of these materials in manufacturing fertilizers.

7 Greater Precision

Gain efficiency and safety by precision control even at maximum ammoniation rates. Maintain effluent at the temperature, physical condition and moisture content desired for best results.

8 Improved Performance

Produce low-moisture, quality-controlled slurry that mixes easily with other fertilizer ingredients for better granulation and reduced re-cycle.

9 Fuel Savings

Use chemical heat of pre-reactor to produce hot, relatively dry slurry, reducing the need for fuel for further moisture reduction of mixed goods in dryer.

10 Fume and Dust Reduction

Minimize the expensive and wasteful nuisance of fumes and dusts usually encountered with conventional systems.

(Continued on next page)

(Continued from preceding page)

11 Simplified Solution Selection

Select and use only one ARCADIAN® Nitrogen Solution for year-round production of a great variety of fertilizer analyses.

12 More Space for Mixed Goods

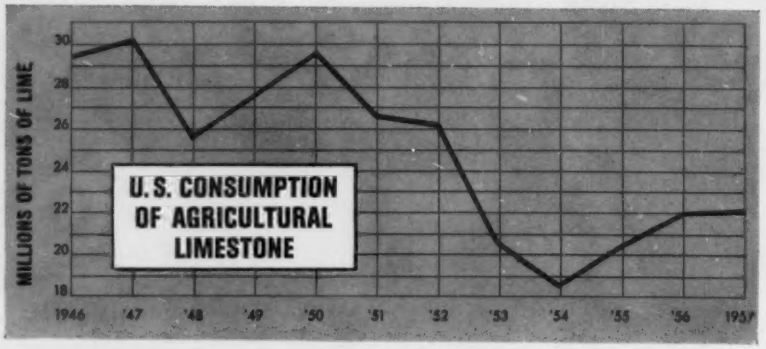
Use storage space for mixed goods rather than solid nitrogen materials. No storage space is needed for solid nitrogen for manufacturing mixed fertilizers when *all* the nitrogen is obtained from ARCADIAN Nitrogen Solutions.

Call Nitrogen Division

Listed above are only a few of the reasons why fertilizer manufacturers are finding that it pays to install and use the pre-reactor. If you are interested in producing high-analysis fertilizers in 2-1-1, 3-2-2, 1-1-1 and 1-0-1 ratios, it will pay you to investigate this new and different technique. You will discover you can make great gains in economy, efficiency, safety, volume, quality, and extra profits!

There is nothing complicated about adding a pre-reactor to your present set-up for manufacturing high-analysis fertilizers. The same standard equipment is used . . . nothing is eliminated. For complete details, contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N.Y. Telephone: HAnover 2-7300.

Many soils need lime to make fertilizer pay. Sell lime to sell more fertilizer!



SELL LIME NOW!

Fertilizer cannot produce maximum returns on soil which is too acid for the particular crop. In fact, soil acidity can reduce the effects of fertilizer in many instances. It will pay you to urge farmers to test their soils and apply the full amount of lime that is needed for best crop results. This increases the farmers' yields and profits and helps to increase your sales and profits.

Lime can bring the soil to the proper pH level for the crop. In addition, the calcium in lime is an essential plant food. Lime also reduces the leaching of fertilizer. And, lime increases availability of phosphorus, molybdenum and certain other elements essential to crop growth.

Most soils in humid areas need lime to reduce soil acidity for major crops. This acid area includes all the territory east of a line from the Red River of Minnesota through eastern Nebraska down through central Texas.

The amount of lime needed per acre, however, varies greatly from farm to farm, from field to field, and even in various parts of the same field. Soil tests will quickly determine the quantity of lime to use.

For best crop yields, farmers should be using at least 80 million tons of limestone per year. But they are far short of that. In Georgia, for example, the 300,000 tons of lime applied in one year is a small fraction of the 1,700,000 tons needed. In Missouri, one-third of the cropland, previously limed, still needs lime, and about half of the pastureland, previously limed, still needs lime. Most cropland in the humid area needs at least one ton of lime every four years. Some acid clay soils require six or eight tons of lime at the start.

The calcium in lime is an important plant food. A 4-ton alfalfa crop removes 100 pounds of calcium from the soil. That's equivalent to 560 pounds of good quality crushed limestone. A ton of cornstalks contains 10 pounds of calcium and a ton of bromegrass, 8 pounds.

When soil acidity causes poor crops, farmers often blame the fertilizers they use. In acid soils, soil bacterial action is retarded. This slows down release of plant foods from organic matter and speeds leaching of fertilizer.

But the biggest disadvantage of soil acidity is its effect of denying phosphorus to plants. This cripples fertilizer's ability to produce profitable yields. In typical acid soils, highly-soluble phosphates are rapidly fixed in the soil by iron and aluminum into compounds from which crops can get little or no phosphorus plant food.

Liming helps liberate some fixed phosphorus in the soil, and also prolongs the availability of phosphates applied in fertilizer. Research indicates that the highest availability for most forms of phosphorus occurs when soils are limed enough to reduce acidity to a pH between 6 and 7.

Long-term crop yields demonstrate the lasting benefit of liming acid soils. In a 12-year Wisconsin test, lime boosted corn yields 14 bushels per acre per year, and hay yields half a ton per acre per year. With lime *and* fertilizer, the yield increase was two to four times greater. In a 4-year Illinois test, lime raised crop value $18.50 per acre per year.

Spreading lime with dealer trucks helps your fertilizer pay off for farmers. Legumes need lime in the surface soil at planting time. For most other crops, you can lime at any convenient time, before or after plowing. Late summer, with dry, firm ground, is an excellent off-season time for spreading lime on hayland, pastures and small-grain stubble. Fall, after harvest, is a good season for liming row-crop land or meadows.

Outdoor living is a big booming trend in America today. Right now, millions of families are outdoors, walking on a tremendous fertilizer market available to you . . . GRASS.

This market is as near as your neighbor's lawn. It extends as far as the nation's sprawling suburbs, parkland and interstate highway systems. More than 14 million acres of turf present an inviting market for high-nitrogen fertilizers.

Fine healthy turf is desired for parks, playgrounds, golf courses, cemeteries, and airports. Factories and offices are landscaped in grass. Millions of miles of highways are banked by grass.

By far the largest grass area surrounds modern homes. Home-owners take pride in attractive lawns. Turf experts estimate that for every million homes built each year, there is an additional 100,000 acres of new lawn added.

Each year 1½ million acres go out of farming to become homes, roads, factories and recreational areas. Most of this area is planted to grass.

Turf experts call grass "America's most valuable crop." They point out that more money is spent for grass than for any other single crop. And remember, there are no crop surpluses to worry about . . . no acreage allotments . . . no government restrictions on the growth of grass for beautifying the landscape.

Consider a recent survey that indicates approximately 140 million bags of lawn and garden fertilizer in packages of 20 pounds and more were sold during 1958. The survey noted that only 50% of home-owners are actually buying fertilizer.

Present customers often could use more. Non-buyers certainly need to be sold. All customers are potentially repeat buyers; once, twice, even three times each year to keep their lawns and gardens growing well.

Turf experts, garden editors and landscape authorities are advocating high-nitrogen fertilizers for grass. They recommend such grades as 2-1-1, 4-2-1, 3-1-1, 3-2-1 and similar high-nitrogen fertilizers. More important to your formulating plans, these experts are advising that fertilizers for lawns and ornamentals contain long-lasting nitrogen.

Home-owners want attractive lawns. They want fertilizer that is easy-to-use, safe-to-handle; that doesn't burn lawns and plants. Most of all they want to see quick results and uniform green growth. High-nitrogen fertilizers, containing a large proportion of slow-release urea-form nitrogen, are in demand.

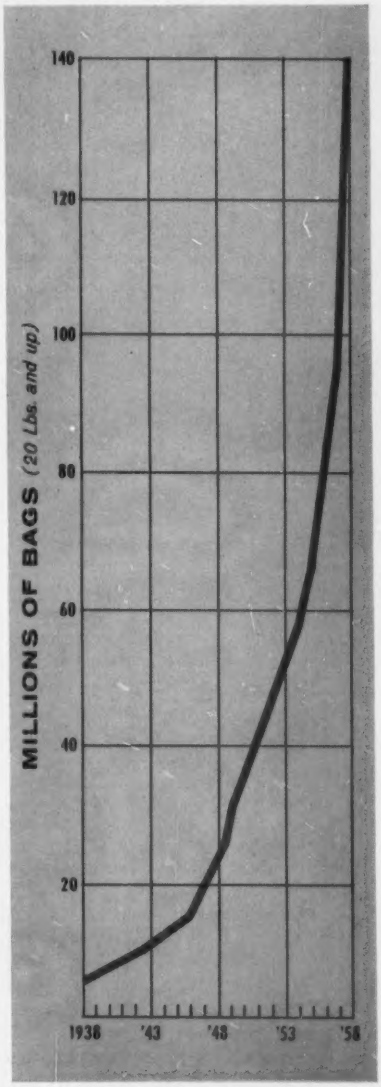
Nitrogen Division research has perfected the process of using N-dure® and urea for manufacturing fertilizers that supply nitrogen to plants at a uniform rate. You can manufacture these popular high-nitrogen fertilizers easily with N-dure, at economical cost.

With N-dure, you can easily make semi-granular, non-segregating, non-burning mixed fertilizers in a variety of popular high-nitrogen combinations. Modern mixed fertilizer that is dustless, easily-applied, safe-to-use, and gives quick growth plus enduring results is in growing demand.

It is estimated that by 1962, over 200 million bags of fertilizer will be bought by non-farm consumers. This vast market is being tapped through garden centers, hardware stores, department stores, food markets and shopping centers.

Find out how easy it is to use N-dure to make your own ureaform nitrogen while blending your mixed fertilizers. Demand for plant food with enduring nitrogen is booming. Start your profit-making specialty fertilizer program now!

A Nitrogen Division technical representative can show you how simple it is to fit N-dure into your production. Contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y. Telephone HAnover 2-7300.



Sales of non-farm speciality fertilizers are going up fast—a big market for you!

HERE'S THE BIG LINE OF Arcadian® NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

Other ARCADIAN® Products: URAN® and FERAN® Solutions • Ammonia Liquor • N-dure® A-N-L® • Ammonium Nitrate • UREA 45 • Nitrate of Soda • Sulphate of Ammonia

NITROGEN DIVISION

MAIN OFFICE: 40 RECTOR ST., NEW YORK 6, N. Y., PHONE HANOVER 2-7300

Allied Chemical

Hopewell, Va., P. O. Drawer 131.....Glenview 8-6301
Ironton, Ohio, P. O. Box 98.....Drexel 7-4366
Omaha 7, Neb., P. O. Box 166.....Bellevue 1464
Raleigh, N. C., 16 W. Martin St.....Temple 3-2801
Columbia 1, S. C., 1203 Gervais St.....Alpine 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E. Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St. Whitehall 8-2692
Columbia, Mo., 1134 Highway 40W.....Gibson 2-4040
Indianapolis 20, Ind., 6060 College Ave. Clifford 5-5443
Kalamazoo, Mich., P. O. Box 869.....Kalamazoo 5-8676
St. Paul 14, Minn., 764 Vandalia St.....Midway 5-9141
San Francisco 4, Cal., 235 Montgomery St. Yukon 2-6840

HOW *Fertilizer Sales* ARE FINANCED

This penetrating study of credit practices in the fertilizer industry was made by Federal Reserve Bank of Atlanta, based on a survey made in the Sixth Federal Reserve District states covered by the bank: Alabama, Florida, Georgia, Tennessee, southern Mississippi and southern Louisiana.

It points out that the fertilizer industry in this area has long been an important supplier of trade credit to farmers.

While they often found such credit costly, farmers have used it because their requirements for operating capital have continued to outpace their accumulation of it.

- **how important is trade credit to the fertilizer industry?**
- **why do fertilizer manufacturers extend trade credit?**
- **how do they provide it?**
- **why do farmers now use trade credit for buying fertilizer?**
- **can bankers in both rural areas and cities lend farmers more of the funds they need for buying fertilizer?**
- **is the use of merchant credit for financing fertilizer on the upswing?**

Trade Credit Widely Used

Financing fertilizer sales with trade credit is an important, widespread practice in the mixed fertilizer industry. Ninety-eight percent of the fertilizer plants responding to our survey make credit sales. At the time of our survey they had from 40 to 6,000 accounts; half of the plants had 280 accounts or more. At small- and medium-size plants—10,000 tons to 25,000 tons capacity per year—the accounts were largely farmers. At plants owned by large regional and national firms, the accounts included farmers, agents, and wholesale distributors. Credit sales totaled more than 80 percent of all sales for four-fifths of the respondents. Open-book credit, which most of them give freely, accounted for at least 75 percent of the credit sales at four-fifths of the plants.

Manufacturers extend trade credit for fertilizer in two major ways: The small plants usually provide credit directly to farmers in their local trade area. Large regional firms sell principally through consignment agents. These agents establish credit lines and terms for farmers, sell the fertilizer, distribute it to farmers during the planting season and charge it to their accounts, guarantee payment, supervise the accounts, and collect them. Throughout this merchandising procedure, the manufacturer holds title to the fertilizer and/or the farmer's receivables. Meanwhile, both the agent and the farmer are liable for the debt. By this method manufacturers of mixed fertilizer control their credit extensions as well as the prices charged for their products. Few firms, small or large, sell fertilizer to wholesale distributors trading on their own accounts.

Trade Credit Practices of Fertilizer Manufacturers

Sixth Federal Reserve District States, May 1959

Credit sales, percent of plants reporting	98
Sales for cash at time of sale, percent of plants reporting	
Less than 20 percent sales for cash	83
Less than 50 percent sales for cash	89
Reasons for extending credit, number of plants reporting	
To obtain more sales	24
Competitors do it	37
Customers expect it	29
Farmers cannot obtain financing from lenders	13
Changes in trade credit to farmers in the last five years, number of plants reporting	
Increased	27
Held steady	16
Decreased	4
Types of credit sales, number of plants reporting	
75 percent or more open-book credit sales	
Direct to farmers	40
Consignment agent	13
Distributor (on own account)	11
75 percent or more secured credit sales	
Direct to farmers	9
Consignment agent	4
Distributor (on own account)	2
Gross margin between cash and time price, average dollars per ton	
Superphosphate	1.54
Mixed fertilizer	2.69
Other fertilizer materials	3.25
Interest rate on extended terms or carry-over balances, percent per year, number of plants reporting	
4 percent	1
5 percent	5
6 percent	37
7 percent	1
8 percent	13
Proportion of credit sales repaid in specific period, number of plants reporting	
70 percent within 90 days	32
70 percent within 180 days	25
Proportion of funds from commercial banks, number of plants reporting	
Under 20 percent	1
20-49 percent	17
50-99 percent	8
100 percent	6
Duration of present credit policies, number of plants reporting	
3 years	3
5 years	7
More than 5 years	42

Most firms responding in the survey said they granted trade credit because they can increase their sales with it, because competitors do it, and because farmers want the credit service. With trade credit, of course, manufacturers can earn income from increased sales and from interest charges which exceed their total costs for the credit service rendered. Trade credit, therefore, becomes a key element in their merchandising programs.

Although manufacturers use trade credit to increase their sales as such, another ultimate goal is to achieve minimum costs through high volume operations. This has special importance to them because crop production is extremely seasonal: Three-fourths of the fertilizer produced is consumed between January and June. With plant capacity excessive for fall operations, a firm's capital costs per ton can go very high if spring tonnage is low. To the extent that a firm can use trade credit to build tonnage, to achieve lower costs per unit, and to reflect them in lower sales prices, all parties benefit.

Finally, farmers prefer to use trade credit for buying fertilizer: It is easily obtained for crop production; it supplements their operating capital; and sometimes their creditors provide them with a marketing service such as ginning cotton.

(Concluded on page 24)

Sources of Funds for Trade Credit

Fertilizer manufacturers obtain funds to finance their trade credit from several sources. Most of the respondents said they finance their credit sales largely from internal funds; several specifically said that they can profitably use their own working capital for trade credit. Manufacturers also use credit from others to supplement their internal sources of funds. They obtain some trade credit from their suppliers, whose terms are usually 30 days net. Some suppliers give a one-percent discount in 15 days, however, which is a strong incentive for prompt payment because it amounts to 24-percent interest per year. In many cases the discount policy is designed principally for equalizing prices between competing plants or otherwise meeting a competitor's price structure. Small- and medium-size plants rely partially on commercial banks for the short-term financing needed for carrying their inventory and accounts receivable through their peak season. Finally, cotton ginners financing fertilizer for farmers sometimes obtain funds from cotton-oil mills seeking the grower's cottonseed. The ginners in turn use these advances to pay the fertilizer companies.

Trade Credit Terms Similar to Bank Credit Terms

Trade credit for fertilizer is similar in some respects to bank credit. Why, then, could bankers not finance part of the fertilizer sold with trade credit? Some firms responding in the survey said bankers could do it, claiming that in many instances bank financing would actually be more advantageous to all concerned.

Terms for trade credit used to finance fertilizer sales are invariably short, and short-term credit is the type of credit bankers like to grant. Few firms reported accounts outstanding over six months old; half of the firms balance most of their accounts in three months. Most manufacturers like to balance their accounts twice a year—in early summer and mid-fall. In June, these manufacturers expect full payment on accounts established from March through May. Subsequent credit sales and carry-over credits are settled in October, November, or December. Settlement dates are less common in Florida where credit to citrus growers may extend for a year and advances for vegetables such as beans and celery are repaid as the specific crop is harvested.

Manufacturers tend to grant shorter terms on direct sales to farmers than on sales through consignment agents; wholesale distributors also obtain short terms. Direct farm accounts at most firms were set up for three months or less, and wholesale distributors typically received 30-day credit. Some companies, however, let distributor accounts run six, nine, or even 12 months, although they usually secure such accounts with interest-bearing notes.

Farmers buying fertilizer "on time" may pay high interest rates for the funds they use. Among reporting firms the average gross margin in 1959 between cash and time prices for superphosphate was $1.54 per ton; it was $2.69 per ton for mixed fertilizer. At $2.69 per ton for the typical three-month term, the annual rate of interest is 26 percent. The "time price" is usually used for sales on extended credit terms, that is, terms beyond the settlement dates or the normal period for open accounts. Ordinarily the time price covers interest charges, bookkeeping and collection costs, and a reserve for losses.

Not all farmers who are granted extended terms pay high rates, and they would not necessarily gain by using bank credit. Competition in the fertilizer industry forces many firms to give more liberal terms. They may give a discount for cash; they may give 60 or 90 days net terms instead of the stipulated 30 days net; they may not charge the time price for extended terms. Judging from data from the firms surveyed, there is less and less adherence to settlement dates and a time price; there is more and more open-book credit on a cash basis from planting to harvest.

Fertilizer manufacturers obtain repayments on their advances in about the same way that banks do. First, farmers often are asked to repay the advances when they harvest their crops or when they borrow from banks at planting time. Second, manufacturers obtain payment principally in cash and in single payments; some firms, however, accept irregular installment payments. When accounts become overdue, fertilizer firms generally prefer to continue them as open accounts and step up their collection activity. Some firms, however, seek additional security: personal notes when the initial terms were not long, and chattel and real-estate mortgages for the longer-term notes. The notes also may carry a stated interest rate of 6 to 8 percent per year. Many firms only call in a collection agency or lawyer to settle an overdue account as a last resort; some never do.

The loss ratio for fertilizer accounts would be acceptable to bankers. Outright or complete losses are few, according to the firms surveyed, probably because the trade terms usually fit the crop financed and the farmer's repayment potential. The risk of loss also is minimized because manufacturers service accounts near their plants, and therefore can follow the accounts closely. Finally, manufacturers keep losses fairly low through their credit investigations.

Trade Credit to Persist

More of the fertilizer sold in District states could be financed with bank credit to farmers, according to data from the survey. Some farmers actually would save money by using bank credit. Nevertheless, a further major shift from trade credit to bank credit is unlikely, since manufacturers do not change their credit policies frequently or dramatically. Most of the firms responding in the survey said they had followed their current credit policies for more than five years. Presumably they will continue to give their customers open-book credit freely. Moreover, in the last five years manufacturers have advanced trade credit direct to more farmers, partly because farms have become fewer and larger in their trade areas. Some firms said their credit sales direct to farmers will grow because farmers need more working capital and larger advances, which they will seek from fertilizer plants. Since most firms making sales directly to farmers indicate that their present policies will continue, a further rise in such merchant credit is likely. Sales through agents and distributors probably will decline.

Finally, fertilizer manufacturers give little indication of tightening their credit terms. Half of the reporters said they planned little change in their credit policy governing future sales; the remaining reporters were about evenly divided as to loosening or tightening their trade credit policies. Thus, farmers wishing to obtain working capital from the fertilizer industry may find it readily available in the future. Meanwhile some firms in the industry probably will ask banks for more financing for carrying their larger receivables through the peak season. Bankers no doubt will step into that credit breach.

CALIFORNIA

Stauffer Chemical suffered a $5,000 fire at a warehouse in Vernon, which occupied 13 fire companies for three hours.

DELAWARE

SunOlin Chemical, jointly owned by Olin Mathieson and Sun Oil, "broke ground" at North Claymont for the $8,000,000 urea plant they are building. The "ground breaking" actually was side-stepped in favor of a scale model of the plant, done in great detail, and said to be very helpful in the planning and in the construction of the plant. The new facility will turn out 200 daily tons of urea via the Montecatini process.

FLORIDA

The Florida Nitrogen Company has awarded a contract to The D. M. Weatherly Company of Atlanta, Georgia for a 20.5% lime nitrate plant. The new facility will be erected in Tampa. The product from the plant will be in granular form. Raw materials will be ammonium nitrate solution and limestone.

INDIANA

Hooker Chemical is in the midst of a varied expansion program, of which the program at Jefferson is of most interest to the fertilizer industry. This includes nearly $1,000,000 which will be spent over the balance of this year on two projects, —a new process for making phosphates directly from ferrophosphorous (details not disclosed) and a new replacement phosphoric acid plant to supplement their plants at Columbia, Tenn. and Dallas, Tex.

* * *

Virginia-Carolina Chemical broke ground at Jasonville, July 7, for a new, ultra-modern fertilizer plant that will serve farmers in Southwestern Indiana and parts of Southeastern Illinois.

The T-shaped structure will be completed and in operation by January 1. In peak seasons, 35 workers will be employed in addition to an office and sales force. Most of the personnel except the sales manager and the plant superintendent will be hired locally.

The plant will produce all analyses of semi-granular fertilizers needed by farmers in this region.

The plant and machinery were designed by Virginia-Carolina engineers under the direction of Frank C. Richter, chief engineer.

Sales manager for the new plant will be G. F. Flenniken, who has been with V-C for nearly 12 years.

Plant superintendent will be Mack Tune who started with V-C in 1953.

KANSAS

Cooperative Farm Chemicals, for whom Chemical Construction Corp. is now expanding the original plant at Lawrence, has announced that the same concern will build for them a new $1,250,000 nitric acid plant, with a capacity of 120 daily tons. This will increase present capacity by about 50%, and will permit further increase of anhydrous ammonia and nitrogen solutions production.

The plant is owned 75% by Consumers Cooperative, 25% by Central Farmers.

* * *

Quaker Oats is planning to rebuild at Hiawatha the structures there lost in last December's fire. The $175,000 project calls for office, scales, fertilizer warehouse and one elevator.

Nearly 180 tons of fertilizer and other raw materials are transferred per hour from ships to warehouse through use of a shore-mounted high speed tower type crane, and two-line, lever arm type buckets like this at Olin Mathieson Chemical Corporation's Baltimore plant. This unit and other similar clamshell buckets, made by Blaw-Knox Company, Blawknox, Pa., handle pelletized fertilizers and other raw materials from ships to dockside tramcars that travel by rail to the firm's warehouse area. A feature of bucket rehandling is retention of pellet size.

LOUISIANA

Olin Mathieson expect to complete the $214,000 addition to their Lake Charles anhydrous ammonia plant by the middle of this month.

MISSISSIPPI

Coastal Chemical's multi-purpose granulating plant is in production at Pascagoula. It was erected by the D. M. Weatherly Company of Atlanta, Ga. and utilizes the Weatherly controlled granulation process for the production of conventional granulated products. In addtion to high analysis granular fertilizers, the plant manufactures ammonium phosphate utilizing phosphoric acid and superphosphate, along with anhydrous ammonia and potash, as raw materials. Diammonium phosphate, 18-46-0, is produced. It also manufactures triple superphosphate utilizing the TVA continuous process.

NEW MEXICO

International Minerals and Chemical plan to install during the next year more than $1,000,000 worth of new mining equipment at their Carlsbad potash operation. Most of this is to permit more efficient working of the ore beds, and to help insure long-term operation of the mine.

OHIO

American Agricultural Chemical has let contract for construction of a $750,000 contact acid plant at Cairo, capable of producing various concentrations of sulphuric acid. This is the second plant of this type for AAC, is scheduled to begin construction this month and be completed by March of next year.

This plant will increase the company's sulphuric production by about 10%, and its output will be largely used in their own operation.

* * *

Scotts Chemical Plant which plans

a $1,000,000 expansion to double fertilizer capacity and increase pesticide output, has secured financing for the project. This new unit represents the final phase of a $3,000,000 program by Scotts Chemical —which is a subsidiary of the Marysville seed and lawn care concern, O. M. Scott & Sons Co.

OKLAHOMA

Nichols Seed & Fertilizer Company, debtor in possession, has been authorized by the U.S. District Court judge to sell its fertilizer plant located on state highway 152, southwest of Oklahoma City.

Bids on the Nichols granulating plant, one of the largest in the state, must be filed in the U. S. District Court clerk's office by 11:00 a.m. August 10, and will be opened at 2:00 p.m. that day. The plant will then be sold, subject to approval and confirmation by the court.

Earl Nichols, president of the firm, said this is the first step in the company's reorganization plan to get out of the farm fertilizer business and devote full time to distribution and production of seeds, agricultural chemicals and allied merchandise for farms and homes.

VIRGINIA

Virginia-Carolina suffered a fire, the result of lightning—at their waterfront plant in Richmond. A three-story conveyor structure used in ship unloading was damaged.

WISCONSIN

American Agricultural Chemical Company's new fertilizer plant at Johnson Creek is proceeding on schedule, according to C. M. Powell, president of the firm.

Begun in early June the first phase of construction is scheduled for completion by November 1, Mr. Powell said. This first phase will include a mixed fertilizer storage building and bag and bulk shipping facilities, which will make Agrico fertilizers available to Wisconsin farmers during the 1960 spring planting season.

AUSTRALIA

Mt. Morgan Mining, Queensland, are seeking $13,500,000 capital for the erection of an ammoniated sulphate fertilizer plant. Mt. Morgan holds millions of tons of iron pyrites, which would be a major raw material source.

CANADA

Sogemines, Ltd., affiliate of Societe General de Belgique, is planning to build at Maitland a $17,000,000 plant to produce ammonium nitrate, N solutions, anhydrous ammonia and hydrogen. Construction, beginning at once, is expected to be completed by early 1961. When complete the plant will supply anhydrous ammonia and hydrogen by pipeline to DuPont of Canada under a long-term contract. Alberta natural gas will be principal raw material. Sogemines is a rapidly expanding company, holding controlling interests in a number of diverse Canadian companies.

* * *

Electric Reduction Company of Canada, Ltd., and **Matthiessen & Hegeler Zinc Company,** LaSalle, Illinois have announced that a long term agreement has been concluded between the two companies.

Matthiessen & Hegeler has formed a Canadian subsidiary, Sherbrooke Metallurgical Company, Ltd., which will build a zinc ore roasting plant at Port Maitland, Ontario, and will supply ERCO with sulphuric acid.

This plant will be adjacent to the new multimillion dollar chemical project already announced by ERCO.

CHILE

Anglo Lautaro Nitrate, Santiago, is reported ready to invest $10,000,000 in mechanization and construction at its nitrate plants. An additional $7,000,000 is forecast to follow this program.

ENGLAND

Fisons' in June held two "openings". June 10 saw the formal inauguration of the new N plant at Stanford-le-Hope, and June 30 at the Avonmouth works they presented to the public their new "40 Range" which uses ammonium nitrate from Stanford-le-Hope.

INDIA

Andhra Pradesh, a State strong in agriculture, with a great need for fertilizer, is undertaking to build a fertilizer plant. The Government has agreed to subscribe 51% of share capital and would have an effective voice in the management of the plant.

* * *

The Union Industries Minister, Mr. M. M. Shah, announced in Patna that the National Industrial Development Corporation would set up in July a subsidiary corporation called the Amjore Pyrites Development Corporation for the production of sulphur, sulphuric acid and fertilizers at Amjore in Shahabad district of Bihar.

INDONESIA

The government's new $30 million, 100,000-annual-ton urea plant, which will be built by Foster-Wheeler as reported here last month, will be located on the Musi River about two miles from Standard Vacuum Oil Company's Palembang refinery. This site is some 60 miles from Standard Vacuum's Pendhope oil fields, from which raw feedstock for the plant will come, under a 20-year contract.

IRAQ

Texas Gulf Sulphur Company has offered to exploit rich sulphur deposits in Northern Iraq, and discussions between the Government and the firm's representatives are now in progress, an official source reports at Bagdad. A final agreement was expected very soon.

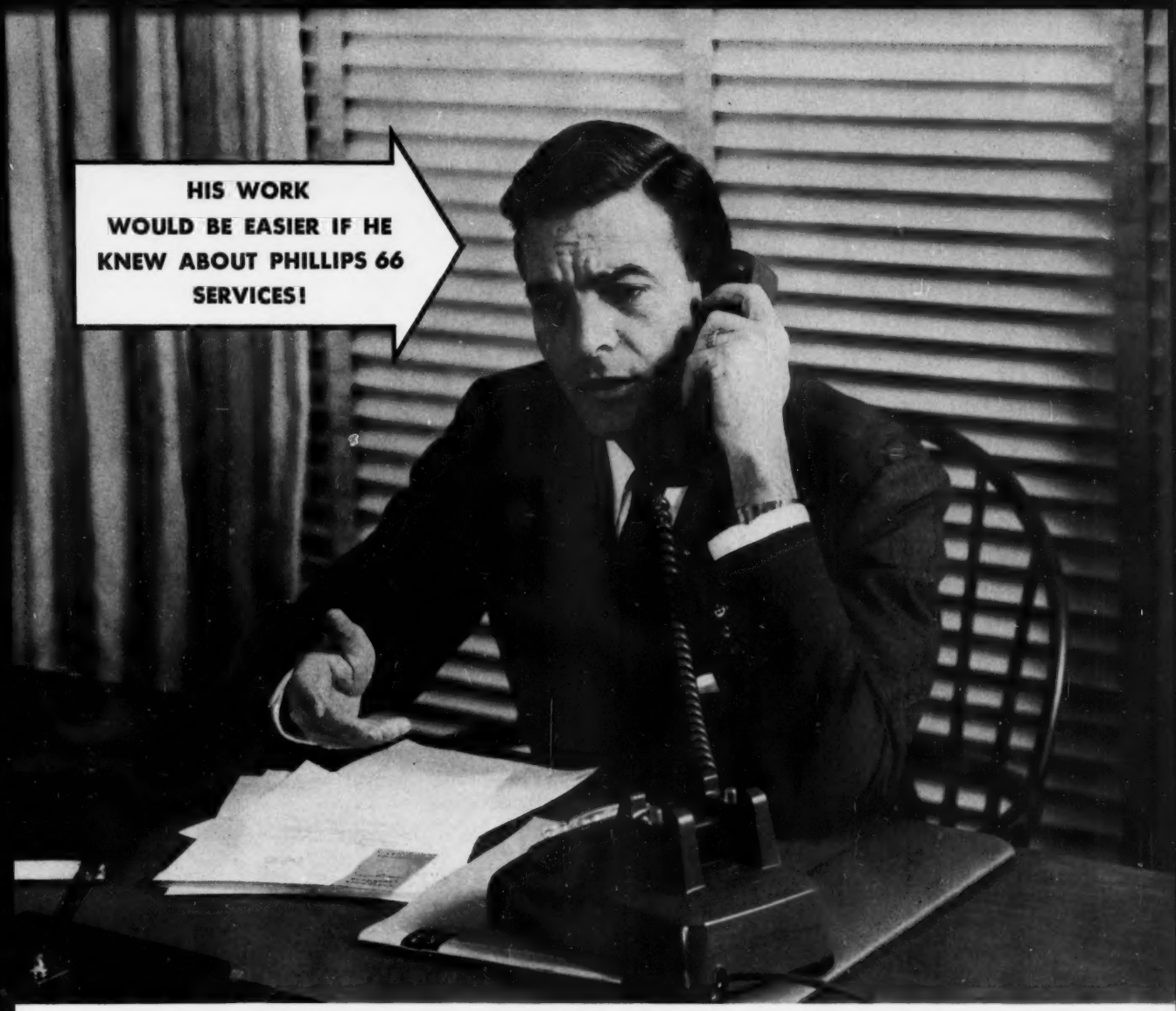
PERU

Montecatini, plus Peruvian capital, has completed and will shortly put in production the $10,000,000 plant there. It is slated to produce nitrate of ammonia and sulphate of ammonia, plus other chemicals for explosives and other industries.

Ammonia Use at Record Volume

The Agricultural Ammonia Institute reports that farmers are apparently using record rates of anhydrous ammonia this year. Jack F. Criswell, their executive vice-president, says a cursury survey indicates that virtually every section of the US is using more this year—and the indication is that total consumption will run well beyond the record 577,000 tons used in the fertilizer year ended June 1958.

The survey reported 25 out of 28 ammonia dealers in 17 states believing their volume will be larger than last year—only one of the remainder expecting a volume reduction. These dealers credit increased application rates and more acres under fertilization as the basis for their belief.



You can depend on Phillips *66* Service and Fertilizer Products

Phillips 66

"Good Name to Mix With"

The harassed executive in the picture above will find his job easier and more profitable . . . if he depends on all the services and products of Phillips *66*.

He'd find, in fact, that technical services and sales services are one with Phillips *66*. The main purpose being: to help mixers make more profit. Mixers can rely, too, on punctual delivery of Phillips *66* materials —Nitrogen Solutions, Anhydrous Ammonia, Ammonium Nitrate, Ammonium Sulfate, Triple Superphosphate. Got a production or sales problem? For prompt attention . . . call, write or wire.

PHILLIPS PETROLEUM COMPANY

Phillips Chemical Company, a subsidiary, Bartlesville, Oklahoma

SALES OFFICES:

Amarillo, Tex., First Nat'l Bank Bldg. • Atlanta, Ga., 1428 West Peachtree St., Station "C" P.O. Box 7313 • Bartlesville, Okla., Adams Bldg. • Chicago, Ill., 7 South Dearborn St. • Denver, Colo., 1375 Kearney St. • Des Moines, Iowa, 6th floor, Hubbell Bldg. • Houston, Tex., 6910 Fannin St. • Indianapolis, Ind., 3839 Meadows Drive • Kansas City, Mo., 201 E. Armour Blvd. • Minneapolis, Minn., 215 South 11th St. • New York, N. Y., 80 Broadway • Omaha, Neb., 3212 Dodge Street • Pasadena, Calif., 317 North Lake Ave. • Raleigh, N. C., 401 Oberlin Road • Salt Lake City, Utah, 68 South Main • Spokane, Wash., 521 East Sprague • St. Louis, Mo., 4251 Lindell Blvd. • Tampa, Fla., 3737 Neptune St. • Tulsa, Okla., 1708 Utica Square • Wichita, Kan., 501 KFH Building

PEOPLE in the Industry

IMC

Thomas M. Ware, president of International Minerals & Chemical Corporation, has been made chief executive officer of the corporation by the board of directors. He has been with IMC for 12 years, and was chief engineer, vice president of engineering, and administrative vice president before being named president in May of 1958. Louis Ware will continue as chairman of the board.

Ware

IMC has announced details of the sales organization for the basic materials department of its new Agricultural Chemicals division. The division combines the former Phosphate and Potash divisions in a major realignment for IMC.

Horne

Everett C. Horne is sales manager of the basic materials department, reporting to Leonard W. Gopp, vice president in charge for the division.

Mr. Horne came to IMC earlier this year after nine years in managerial posts with Bradley & Baker.

The sales staff, which will handle the full line of IMC fertilizer ingredients, will consist of five regional managers under Mr. Horne, supported by 12 district managers.

Broadway

Lindsey

Regional managers are Fred C. Broadway, Atlanta; George J. Urbanis, Indianapolis; Gerd W. Kraemer, Minneapolis; Jack K. Lindsey, Shreveport; and William W. Chadwick, New York.

District managers are Gaines Boynton, Walton Dennis, Milton Malone, James Baskin, and Judson Drewry in the Atlanta region; Thomas Bruns and H. Clair Dyer, Indianapolis; Richard Falck and William Lane, Minneapolis; Harold Hoffman, Shreveport; and Robert Heuerman and Basil Surgent, New York.

Indianapolis and Minneapolis are new regional offices for areas formerly served from IMC's Skokie, Ill., headquarters.

Minute Maid Groves

In an administrative realignment, Minute Maid Groves Corp., Orlando, Fla., has promoted Harold Garrett to manager of fertilizer operations. He will not only supervise the company's Dr. Phillips fertilizer plant, but will direct as well the nutrition and improvement of the citrus trees.

Pacific Agro

The board of directors of Pacific Agro Company has accepted the resignation of Bob Allard as vice president and manager of the company. Mr. Allard is moving to Phoenix, Arizona where he will be located after August 1. Lee Fryer has been appointed vice president and manager. Simultaneously, Grant Cline has been appointed manager of the agricultural chemical division and will serve in this capacity while retaining residence in Yakima, Washington.

Central Farmers

Clifford J. Kindschi has become sales manager of nitrogen products for Central Farmers Fertilizer Company, Chicago. This announcement was made by Bob Garn, director of marketing.

Mr. Kindschi formerly was with Wisconsin Farmco Service Company, Madison, where his work included sales, production and management of operations. He spent four years as foreman at the University of Wisconsin, Hancock Branch Experiment Station. Between 1943 and 1945, he was a county agent.

Farm Chemical

Ralph Dush, manager of Buckeye Sugars, Inc., Ottawa, Canada, has resigned to join a business partnership with George Fleming in the Farm Chemical Co. at Longmont, Colo. Mr. Dush came to Ottawa in 1939 as county extension agent.

St. Regis

St. Regis Paper Company announced that Lynn Willoughby has been appointed resident manager of the company's multiwall bag plant at Toledo, Ohio. Mr. Willoughby, who has been assistant manager there, succeeds Arthur G. Hartman, who died recently. Mr. Willoughby joined St. Regis in 1936.

Dorr-Oliver

J. D. Hitch, Jr., president of Dorr-Oliver Incorporated, announces election of Lloyd R. Boling as executive vice president of the company. Mr. Boling, who was previously vice president for operations coordination, will have responsibility for administration of the operating affairs of both the parent company and subsidiaries, while Mr. Hitch as president will, in the future, devote a major share of his efforts to corporate policies, long-range planning and other areas involving broad corporate relationships.

A further realignment of executive responsibilities within the company is the assignment to vice president T. Bartow Ford of overall responsibility for all activities involving design, engineering and sale of complete plants including Fluo-Solids installations.

To fill the vacancy created by Mr. Ford's change of responsibility, Glen G. Reed, former general sales manager, was elected vice president for sales. In this post he will assume responsibility for sales, service and field engineering functions of the company within the United States.

Continental Can

Donald W. Rauch has been appointed midwestern sales representative for the multiwall bag line of Continental Can Company, it was announced by Dean P. Stout, general sales manager of the company's Containerboard and Kraft Paper division.

Mr. Rauch, who will maintain his headquarters at the division's Chicago office, has seven years experience in the multiwall bag field. He worked previously for Union Bag-Camp Company in the same territory.

Grace Chemical

Dr. Robert Q. Parks has been promoted to general manager of Grace Chemical Division, W. R. Grace & Co., division president William J. Haude has announced. Frank J. Ronan succeeds Dr. Parks as general sales manager.

Parks

Ronan

Dr. Parks joined Grace in 1953 and has served as general sales manager since 1955.

Mr. Ronan was formerly Midwestern district sales manager for Grace Chemical and joined them in 1954.

Grace has appointed P. Paul Lowery and Joe D. Leeke to their sales staff.

Lowery

Leeke

Mr. Lowery is assigned to the Memphis district sales office. He will represent them in the states of Texas, Oklahoma, Kansas and New Mexico.

Mr. Leeke recently with the sales service department of the division, is promoted to the Memphis district sales office. In his new capacity, he will travel in the state of Tennessee, Kentucky, Missouri and southern Illinois. Mr. Leeke joined the Grace Organization in 1954.

Bemis Bro.

P. E. Morrill, vice-president of the Bemis Bro. Bag Co., has retired after 45 years of service with the company. Among other duties, he served as company patent officer and was responsible for the operation of the insurance department and the Claremont, N. H., paper mill. He will continue as a director of the company.

Agrico

The following changes in production personnel have been announced by D. S. Parham, vice president in charge of production for The American Agricultural Chemical Company:

W. C. Coale, Jr., former foreman at East St. Louis, becomes assistant superintendent at East St. Louis.

W. M. Callahan, former assistant superintendent at Cleveland, Ohio, has been named superintendent at Three Rivers (Phoenix), N. Y.

L. V. Gue, former assistant superintendent at Carteret, N. J., becomes superintendent at Cincinnati, Ohio.

J. T. Hailey, former assistant superintendent at Baltimore, Md., has been transferred to Detroit in the same capacity.

Elbarae Harrison, former general foreman at Pierce, Fla., becomes superintendent at Johnson City, Tenn.

P. J. Iten, former foreman at Knoxville, Tenn., was named assistant superintendent at Danville, Ill.

M. E. Johnson, former foreman at Detroit, becomes assistant superintendent at Carteret, N. J.

G. M. Lloyd, Jr., former assistant superintendent at Detroit, Mich., becomes responsible for sodium tripoly phosphate production at Carteret, N. J., reporting to Plant Superintendent H. C. McKinnon.

K. R. Treiber has been transferred from Three Rivers, N. Y., to Fulton, Ill., as assistant superintendent.

Personnel changes announced by Dr. D. P. Satchell, manager of agronomic services for The Ameri- agronomic services for Agrico include:

J. H. Gilleland, former staff agronomist in AAC's New York office, has been named regional agronomist at Humboldt, Iowa, covering central and western Iowa and southern Minnesota.

R. D. Sibley, Jr., formerly staff agronomist in New York, becomes regional agronomist for New England and eastern New York State, including Long Island. He will be located at North Weymouth, Mass.

Dr. Donald B. Pfleiderer has joined the staff, and will be located at AAC's Detroit office from which he will assist W. K. Kidder in field service work in the Mid-West sales division, which includes Michigan, Ohio and portions of surrounding states.

Quaker Oats

The appointment of Norman C. Stephens as Western district sales manager for the chemicals division of The Quaker Oats Company has been announced by Dr. Homer R. Duffey, vice president.

Stephens

Mr. Stephens joined Quaker Oats as a technical sales representative in the Chicago office in 1949 and traveled Eastern Canada. In 1951 he was transferred to Portland, Oregon and assigned primarily to sales development of Furafil 100 as a glue extender in making fir plywood. In this capacity he traveled the Western United States and Canada. In his new post, he will continue to be located in Portland.

Olin Mathieson

Arthur T. Safford has been named divisional vice president for marketing of the packaging division of Olin Mathieson Chemical Corporation, it was announced by Robert H. Evans, divisional vice president and general manager.

Mr. Safford succeeds Walker Hamilton, who has been with Olin Mathieson since 1956 when he retired as president of Riegel Paper Corporation. Mr. Hamilton will continue as a consultant.

Chase Bag

Chase Bag Company has appointed Thomas A. Eadon, Jr., sales manager of its New York sales department, of which W. J. Newhouse is manager. Mr. Eadon has been connected with the firm's Philadelphia branch since 1948.

Eadon

Woodrich

E. M. "Woody" Woodrich, who has been associated with Chase's Philadelphia branch as a sales representative in the Baltimore area, will succeed Mr. Eadon as sales manager in Philadephia. He has been with Chase since 1953.

Cyanamid

Frederick E. McCormick has been appointed manager of commercial developemnt for American Cyanamid Company's Agricultural Division, it was announced by B. F. Bowman, division marketing director. Previously manager of market research for the Division, Mr. McCormick has been with Cyanamid since 1957.

McCormick

First Packaging

Frank H. Jones of Monroe, La., has been named vice president and general sales manager of First Packaging Corp., a subsidiary of First Mississippi Corp., under construction at Yazoo City.

First Packaging will make multiwall bags.

Bureau of Mines

Thomas E. Howard, formerly of the Bureau of Mines field office, Spokane, Wash., has been named chief of the Bureau's Branch of Ceramic and Fertilizer Materials in Washington, D. C., the Department of the Interior has announced. He succeeds W. F. Dietrich, who recently became chief, Division of Mineral Resources at the Bureau's San Francisco regional office.

Miller Products

Roy Miller, president of Miller Products Company, Portland, Oregon, has announced appointment of two additional sales representatives.

Donaldson

Williams

Allen Donaldson, who returns to the company after two years absence, takes over small package sales in the Portland and lower Columbia area of Oregon.

Dick Williams comes to them after four years agricultural chemical sales experience and will represent the company in Eastern Washington and Northern Idaho.

Meyer

Theodore I. Stone has been made vice-president and treasurer of Wilson & Geo. Meyer & Co., Western distributors of agricultural and industrial chemicals and plastics, Jeffery W. Meyer, president of the firm, has announced. He joined the firm in 1938.

U. of California

Dr. R. Merton Love, professor of agronomy and range improvement researcher, has been named chairman of the Department of Agronomy on the University of California campus at Davis.

He will replace Maurice L. Peterson under a new policy of rotating department chairmanships in the University's Division of Agricultural Sciences, Dean Fred N. Briggs said.

Dr. Love joined the University in 1940.

Farmers Union

Frank Calvin retired from Farmers Union Exchange, St. Paul, Minn., July 6 after 28 years, 16 of them as head of its feed and fertilizer division. He has also served as a director of Central Farmers Fertilizer Co.

Shell Chemical

Shell Chemical Corporation's Union, N. J. technical service laboratory has been reorganized along product lines, according to an announcement by G. W. Huldrum, vice president.

E. S. Loeffler, with Shell since 1945, is manager of agricultural chemicals under laboratory director F. S. Swackhamer. Mr. Loeffler was formerly senior technical representative of the agricultural chemicals division.

Chase Bag Renames Closure

Chase Bag Company's new moisture-proof bag closure system has been renamed "Chasetite", to more closely identify the process with its originating company, it was announced in New York by R. H. Ayers, vice president in charge of the firm's paper bag division.

"Chasetite" is a method of closing both ends of multiwall paper bags with a seal that gives positive protection against moisture penetration. The bottom closure is made by Chase when the bag is manufactured. The same type of closure is applied to the top of the bag in the user's own plant by using a special Chasetite closure unit which adapts to any existing conveyer or bag filling equipment. The units are available from Chase Bag.

Chasetite is a tape-over-sewn closure using a special tape, adhesive and method of application, which gives a perfect bond, even with dust particles on the tape, and apply at such speed that heat will not scorch the paper or melt a poly-coated inner sheet. Further information can be obtained by writing the Paper Bag Division, Chase Bag Company, 155 East 44th Street, New York, New York.

BOOKS

NPFI's Fertilizer Salesman's Handbook, only recently introduced at a school reported here, has already gone into the third printing.

American Potash Institute will shortly issue a book entitled "You can grow a good lawn." Dr. Robert W. Schery will tell the people to stick with grass mixtures rather than try a single variety. Dr. S. E. Younts writes about the use of fertilizers, getting back to fundamentals. J. Fielding Reed suggests soil tests, expert advice and study of reliable circulars. W. H. Daniel points out that the proof of any lawn is the grass leaves, and to get uniformly green leaves you must apply plant food.

As all these are recognized authorities on the subject chapters they have written, this should be a helpful book for fertilizer people to encourage among their customers. It is a 32-page volume with a 4-color cover, and can be secured by writing News Service, American Potash Institute, 1102 16th St., N.W., Washington 6, D. C.

THE MOST PRODUCTIVE FARMS THE *World has ever Seen*

A technological revolution has transformed the family farm into the most productive the world has ever seen. Output per man hour is up 80 percent since 1940. Output per farm is up 74 percent. Farmers planning to farm the same this season as they did last season are out of date, says Spuds Johnson, Florida AES.

It has all come so suddenly that few folks away from the farm know it has happened. A typical family illustrates the point.

Twenty-five years ago a father, his four sons and a hired hand ran a 200-acre farm. Horse-drawn implements, horse liniment and lots of human muscle were the main tools. They worked from sunup to sundown.

The mother pumped and carried water, turned her washing machine by hand, cooked over a wood stove, baked her own bread and then went out in the field to load hay or help somewhere else.

Three of the sons still farm in the same community. They never miss a county fair, a public sale, or a ball game where their kids are playing. They find time to serve with the county Farm Bureau, the Soil Conservation District and the school board, while operating a 300-acre farm without hired help.

With a six-row planter, they plant 60 acres a day. Their seven-foot combine harvests grain at a 20-acre-a-day clip. The one-man hay baler turns out 1,000 bales a day. Even the chore of manure hauling has been transformed into a painless mechanical operation. Loading and spreading a ton takes about 10 minutes.

Better feeds, better breeds and better seeds to go along with these tools have made each family farm a potential oasis. A dairyman can milk 50 cows alone and produces 500,000 pounds of milk per year. A beef breeder feeds 200 steers in 15 minutes, thanks to mechanical choring. A hog raiser has no problems rearing 1,000 hogs a year. A broiler producer produces 160,000 meat birds a year.

The tools are important, but it takes a man to run them. The successful modern farmer is a jack of all trades and master of most. He must be engineer enough to run $30,000 worth of machinery and equipment, and blacksmith enough to fix a breakdown on the spot. He must be economist enough to know when to buy feeder cattle and when to sell, but bookkeeper enough to spot weak points in his operation. He must have some knowledge of the veterinarian's skill, of chemistry, of agronomy.

The modern farmer is both a capitalist and day laborer. He must have brains enough to make 40 decisions daily, brawn enough to toss around bags of fertilizer, and self-confidence enough to walk into the bank and ask for a five-figure loan without batting an eye.

Today's family farm has a new look, a new vitality. The high degree of efficiency on our family farms, powered with versatile tools, managed by imaginative minds and sparked by the incentives of the American free enterprise system, has rewarded the entire population with food and fiber beyond our needs.

Soil Conditioners

How do organic soil conditioners compare with conventional fertilizers?

To answer this question, you need to know how much you're paying for plant food in the organic material. Then check this against commercial fertilizer prizes. When compared in this manner, they are seldom an economical source of either plant nutrients or organic matter.

Merle Halverson, extension soils specialist at the University of Minnesota, points out that nitrogen, phosphate and potash retail for about 15 cents, 10 cents and 5 cents per pound, respectively, in mixed chemical fertilizer.

You may not be able exactly to determine the amount of these nutrients in a given conditioner. Their analysis need not be listed on the bag. However, they are generally quite low in nutrient analysis.

CHANGES

Home Guano

Home Guano Co., Mullins S. C., a division of The John Cooper Stores, has been renamed Cooper Fertilizer & Chemical Co.

Armour

Armour has consolidated its chemical and ammonia divisions to form a new division known as Armour Industrial Chemical Co. Management and sales personnel remain the same. The consolidation was logical because both divisions had an interest in ammonia.

Stauffer-Victor

The directors of Stauffer Chemical Company and Victor Chemical Works reached an agreement in principle for a merger of the two companies subject to stockholder approval, it was announced July 7 by August Kochs, chairman, and Rothe Weigel, president, of Victor, and by Christian de Guigne, chairman, and Hans Stauffer, president, of Stauffer.

The merger proposal provides for an exchange of one share of Stauffer common for each share of Victor common. This will involve issuance by Stauffer of approximately 1,700,000 common shares in addition to the 7,242,670 Stauffer shares now outstanding. It is contemplated that the Victor 3½% $100 par value preferred shares will become 3½% $100 par value preferred shares of Stauffer.

As soon as the necessary formalities are completed, a plan of merger is to be submitted to the stockholders of both companies.

The consolidation will unite two pioneer companies which are leaders in their respective fields. Victor's extensive operations in phosphates and allied products will complement Stauffer's position in basic industrial and agricultural chemicals. Sales of the combined enterprise in 1959 are expected to exceed 225 million dollars.

The Stauffer board will be expanded by the addition of three members of the present Victor directorate. The Victor organization will remain intact, with headquarters in Chicago. Victor operations will be carried on as the "Victor

Chemical Division" of the Stauffer Chemical Company with Rothe Weigel as the president and general manager of the division.

St. Regis

St. Regis Paper Company has proposed to exchange shares looking to the acquisition of Chemical Packaging Corporation, Savannah, Ga. which manufactures and sells multiwall bags in two plants—one at Savannah, the other at Louisville, Ky.—and whose sales last year were over $3,000,000. This will strengthen the St. Regis facilities in the Southeast.

St. Regis has also proposed to exchange shares with Lone Star Bag & Bagging Co., Houston, Texas, which owns control also of Wagner Bag Co. of Utah, and 43.7% of the stock of Lubbock Bag Co., Lubbock, Tex. These also make and sell multiwall bags and other packaging products, and serve surrounding areas—Utah, Idaho, Colorado, the Texas Plains, New Mexico.

The Wagner concern is scheduled to move this Fall into a new $1,500,000 plant at Salt Lake City.

Yale

Masterson's Equipment, Inc., with sales and service center in Seattle and sales office in Tacoma, has been named franchise representative for Yale industrial lift trucks and tractor shovels in Western and Central Washington State by Clyde R. Dean, Jr., general sales manager, Yale Materials Handling division, The Yale & Towne Manufacturing Company.

Headquarters for the company was recently moved to a location with improved faciilties at 1452 Elliott Ave., W., Seattle 99, Wash.

Highway Equipment

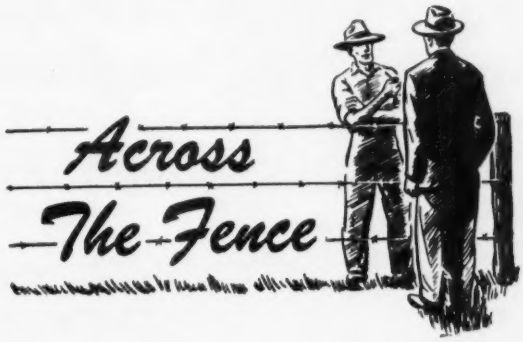
Truck Equipment Company, Fort Smith, Arkansas, is a new distributor for Highway Equipment Company, Cedar Rapids, Iowa. They will handle "New Leader" Lime Spreader, Combination Lime and Fertilizer Spreaders, Wide Spread Lime and Fertilizer Spreaders, and Mobile Blenders.

Truck Equipment Company serves the State of Arkansas. Address of the new distributor is 409 North "B" Street, Fort Smith, Arkansas.

P & R Truck Equipment Company, El Paso, Texas, is another distributor for Highway Equipment Company, serving the El Paso area. Their address is 1801 Olive St., El Paso.

Industry Meeting Calendar

DATE	EVENT	LOCATION	CITY
Aug. 12-13	Northeastern Safety School	Statler Inn. Cornell Univ.	Ithaca, N. Y.
Aug. 18-19	Midwestern Safety School	Safety Council Hdqtrs.	Chicago, Ill.
Aug. 18-22	Canadian Fertilizer Assn.	Bigwin Inn	Lake of Bays, Ont.
Aug. 27-28	Southeastern Safety School	Heart of Atlanta Motel	Atlanta, Ga.
Sept. 3-4	Fertilizer Salesmen's School	N. C. State College Union	Raleigh, N. C.
Sept. 14-17	Fertilizer Division ACS	Haddon Hall	Atlantic City, N. J.
Sept. 24-25	Northeastern Fertilizer Conference	Biltmore Hotel	New York City
Sept. 30-Oct. 1	Southeastern Fertilizer Conference	Biltmore Hotel	Atlanta, Ga.
Oct. 14-16	Pacific N.W. Fertilizer Convention	Chinook Hotel	Yakima, Wash.
Oct. 15	Chemical Control Conference	Shoreham Hotel	Washington, D. C.
Oct. 15-16	Fertilizer Control Officials	Shoreham Hotel	Washington, D. C.
Oct. 19-20	Fertilizer Safety Section	LaSalle Hotel	Chicago, Ill.
Nov. 4-6	Fertilizer Industry Round Table	Mayflower Hotel	Washington, D. C.
Nov. 5-6	Far West Safety School	Hacienda Motel	Fresno, Calif.
Nov. 8-10	Nat'l. Fertilizer Solutions Assn.	Statler Hilton	St. Louis, Mo.
Nov. 9-11	California Fertilizer Association	Fairmont Hotel	San Francisco, Calif.
Nov. 12-13	Southwestern Safety School	Tropicana Motor Hotel	Pasadena, Texas



facts to help you sell

We hear a lot these days about increased nutrient content of fertilizers, and about the negligible increase in cost—especially when compared with other things the farmer buys—during the past couple of decades. Most of these statistics are based on national averages. It is seldom you have an opportunity to study an individual "case history" drawn from the records of a specific manufacturer. But we have one here, thanks to a nice letter from E. B. Johnston, manager of Centrala Farmers Co-Op. at Selma, Ala. Mr. Johnston points out that these figures are taken from their CPA's audit for the years of 1939 and 1959, and cover all mixed goods and fertilizer materials handled during those particular years.

The plant nutrient content of Centrala's output in the 20-year span rose from 17.3 units to 26.2 units, an increase of 51½%. In the same period, cost per ton rose from $24.74 to $37.72, an increase of 52¼%. Cost per unit of plant food, Mr. Johnston points out, went *up only one cent* in the two decades of inflation; per-unit cost of plant food was $1.44 this year as compared with $1.43 in 1939 . . . a gain of only 7/100ths of one percent!

Actually, according to Mr. Johnston, the *true cost of a unit of plant food has actually been reduced* at Centrala, because the 1939 output was entirely in 200-lb. bags, and the 1959 output was packaged in 100-lb. bags . . . so the mixer has absorbed a substantial increase in bagging costs without passing them along to the customer who benefitted by them. In addition, he emphasizes, the 1959 cost averages include more than a thousand tons of mixtures which contained high-priced insecticides and/or minor minerals which were not in the 1939 mixtures.

With these factors considered, the actual cost of plant food to farmers is a fraction less than it was 20 years ago, so Mr. Johnston concludes: "any industry capable of lightening its customers' physical burden" so greatly while keeping costs at what they were twenty years ago "can feel proud of such accomplishments."

We heartily agree, and are grateful to Centrala for permission to publish these figures.

Take those big preseason savings on LION® E-2 now!

It's the one and only ammonium nitrate you can safely store for big spring markup and extra profit! Lion E-2 is free-flowing when you get it...free-flowing when you sell it...no matter how long you store it!

NO CAKING... GUARANTEED. Lion E-2 prills won't break down, crumble or cake under the heavy weight of stacking in shipment or storage. E-2 is free of dust and fines . . . not affected by extreme temperature changes or humidity. You and your customers can buy now, store safely until used. Guaranteed storage-stable.

EASY-TO-HANDLE BAGS. Lion E-2 multiwall bags are specially coated with Monsanto Syton®—the antislip agent that lets you stack Lion E-2 higher . . . move it faster . . . handle it easier. It helps you save time, work and space . . . reduces material losses through breakage due to slippage.

TAKES LESS STORAGE SPACE. Lion E-2 has the greatest density of any ammonium nitrate on the market. It's less bulky . . . takes 20% to 25% less storage space. It saves you needed floor area. It isn't necessary to spread out E-2 in smaller stacks. With E-2 you stack higher utilizing all available storage area, without fear of caking. You can *safely* stack E-2 higher.

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Always stores...

Always pours

Photo taken at warehouse shows Lion E-2 stored in huge quantity (rows are stacked 27 bags high) with no danger of caking, shifting or sliding. Winter moisture won't cake Lion E-2 . . . not even the bags on the bottom. Lion E-2 won't cake in your storage area either . . . **we guarantee it.**

Order Lion E-2 Now . . . Order Big . . . Cash in Big!

SUPPLIERS TELL US ABOUT EQUIPMENT

Multiwall Bag Feeder

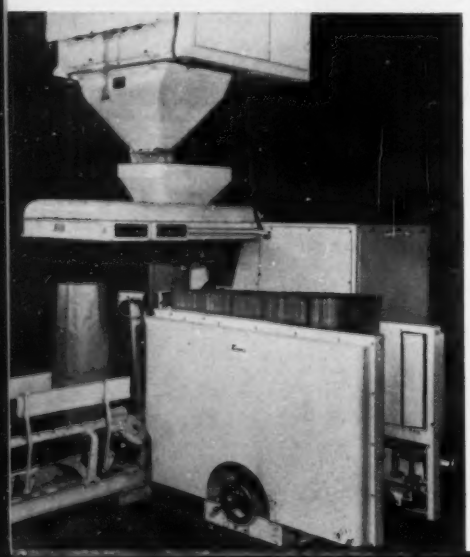
The development of a machine claimed to be the first efficient and fully operational automatic open-mouth multiwall bag feeder has been announced by the Bemis Bro. Bag Company. It will operate at speeds of 16 bags per minute, and at even higher speeds with some free-flowing products with ample bin supply systems, according to the company.

The 'Auto-Mac' multiwall bag feeder handles a wide range of bag dimensions—50 lbs. and up. It is equipped with an easy-loading magazine which holds a large supply of bags.

The unit is furnished with a new control system for simplicity of operation—a switch to activate the cycling operation and individual controls to regulate speed. No special training is required to maintain the ruggedly-built unit. One handwheel, located on the side of the unit, adjusts the bag width and a rear handwheel the bag length. No other adjustments are necessary.

The 'Auto-Mac', which handles a full range of free-flowing products, automatically feeds the bag to the bagholder which receives discharge of the product from an overhead scale, thus eliminating manual placement of the bag on the scale bagholder or spout.

As the product is discharged into the bag, the 'Auto-Mac' automatically delivers the filled bag ready for closing.



The Auto-Mac is designed with two steel arms containing vacuum cups. One arm moves forward to the magazine and draws out one bag neatly from the vertical stack. The second arm moves behind the bag and opens it.

Two vertical bars, equipped with air operated clamps, then grasp the opened bag and lift it on the bagholder. The bagholder then holds the bag firmly to the spout during filling. All components are timed by one master drive.

Bags are removed from the magazine in a consistent, uniform manner to keep weighing, filling and closing operations running more efficiently and economically.

The unit obtains maximum efficiency with various packing units now manufactured by Bemis, but it also works well with other scales, usually with only minor adaptations.

Engineering specifications and operational data are available by circling Number 1 on CF's Information Service Card, page 39.

Jet Pulverizers Brochure

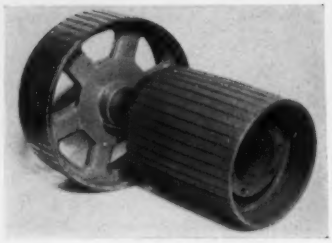
An informative new brochure on Jet Pulverizers, for the dry pulverizing of materials to micron-size powders, is being distributed by Jet Pulverizer Company.

Grinding, pulverizing and processing actions of Jet Pulverizers are graphically described in this colorful brochure.

Originally used in the cosmetics, paints, petroleum and chemical processing industries, Jet Pulverizers now process materials so that they often display new physical characteristics—thus making them adaptable for use in scores of new applications.

Ruggedly constructed and powered directly by compressed air or superheated steam, Jet Pulverizers are available in eight custom-made sizes, with mill diameters from 2" to 36".

A copy of the brochure can be obtained by circling Number 2 on CF's Information Service Card, page 39.



Tire-tread Pulley

Less slippage, longer belt life, and quieter operation without the use of belt dressings are advantages claimed for the Neverslip line of flat belt pulleys offered by Republic Engineering & Mfg. Co. A distinguishing feature of these pulleys is their corrugated (cross grooved) surface which is said to give the pulleys their remarkable properties by preventing the entrapment of air between the belt and pulley surface. Neverslip pulleys may be used for replacement of original equipment in any flat-belt power transmission but are particularly adaptable to short center distances and where intermittent machine loads are encountered as in hammermills, grinders, chippers, crushers, etc.

Virtually all sizes of pulleys are carried in stock from 3½" to 16" diameter and in various widths up to 12 inches to fit standard QD hubs. Fixed bore types are also available. For more information, circle Number 3 on CF's Information Service Card, page 39.

New Shredder Bulletins

Two new bulletins just released by Royer Foundry & Machine Company picture and describe their complete line of shredders for hand-shovel and tractor-bucket fed operations. The units are designed to solve shredding, blending, mixing and aerating problems.

Bulletin NS-59 covers shredders hand-shovel fed operations. Royer manufactures three models in this series with capacities from 5 to 12 cu. yds. per hour. Model "8" is a completely new shredder. The other two models, "10" and "12", have been completely re-designed to do an even better job than ever before. All three models are portable units and are available with either built-in electric motor or gasolline driven engine.

Bulletin S-59 pictures and describes shredders for "mechanically fed" operations. There are also three models in this series with capacities from 20 to 150 cu. yds. per hour. Both portable and stationary units are available with the same drive provisions as the above series. These three models of Royer Shredders are built with either low hoppers (suited for continuous feeding by conveyor) or batch hoppers (designed for controlled feeding by tractor buckets).

Copies of these new bulletins can be had by circling Number 4 on CF's Information Service Card, page 39.

Equipment News . . .

B-I-F Bulletin

A new bulletin illustrating and describing equipment, systems, and controls for the process industries has been announced by B-I-F Industries, Inc., manufacturer of process instrumentation, equipment and systems for positive control of materials in motion. Representative equipment from Builders-Providence, Proportioneers, and Omega divisions of the company is included.

The eight page, two color bulletin contains information on Builders-Providence Differential Producers and Process Instrumentation, including the Plastic Dall Flow Tube, Venturi Tube, Flow and Insert Nozzles, Conveyoflo meter for continuous weighing of bulk dry materials, and the company's Chronoflo Telemetering Systems for remote metering and control of processes.

Omega Feeders for controlled feeding of solids and liquids are included: Gravimetric and Volumetric types, Batch and Continuous Feeders. Among the many models illustrated and described are the Belt Gravimetric Feeder, Pneu-Weigh stream Weigher, Volumetric Disc Feeder, Rotolock, Loss-In-Weight and Rotodip Feeders, etc. Omega Simplex and Duplex Continuous Loss-In-Weight Feeding Systems for Solids and Liquids are also featured.

Proportioneers, the third division of B-I-F Industries, Inc. is represented in the bulletin with Two Component Blenders for continuous in-line blending, Panel Blenders for high rate volumetric blending of many liquids, Additive Systems, and Proportioneers Pumps for automatically proportioning of additives, slurries, etc.

For your free copy of Bulletin B-I-F 5-1, circle Number 5 on CF's Information Service Card, page 39.

Conveyor Drive

A new and more compact conveyor drive has been developed by The Crichton Company.

This unit, which employs the same standard gearing used in the Crichton Planetary Gear Reducer, is available from 1 to 10 HP and can be supplied in any one of 30 different ratios ranging from 2½ to 1 up to 215 to 1.

The reducer is completely enclosed in a dirt free drum from which it can be quickly removed by loosening 6 bolts. Drum diameters start at 12".

The system is also available for winch and hoist mechanisms, where the gearing can be incorporated in the drum.

Full information can be obtained by circling Number 6 on CF's Information Service Card, page 39.

Idler, Pulley Bulletin

A new 72-page bulletin, No. 5980, on belt conveyor idlers and conveyor pulleys has been published by Chain Belt company.

Bulletin 5980 carries complete information on Rex rated idlers, including model 1500 idlers with permanently sealed ball bearing rolls for intermediate or moderate loads at moderate speeds. In addition, it contains information on a complete line of welded steel pulleys for belt conveyor, bucket elevator and package-duty service.

A special 10-page section of the bulletin, with easy-to-read charts, outlines a quick and accurate method for properly selecting belt idlers to insure top performance.

For your free copy of bulletin 5980, circle Number 7 on CF's Information Service Card, page 39.

Heavy Duty Checkweigher

A new, illustrative four-page folder describing the latest development in heavy duty, high speed checkweighing is announced by Toledo Scale, Division of Toledo Scale Corporation.

The colorful literature illustrates and describes the features and advantages of the new Toledo Model 9400 Automatic Checkweigher. It is pointed out that this Toledo Checkweigher handles bags and other items, while in motion, within a weight range of 50 lb. to 200 lb. The zone widths may be varied from approximately 2 to 8 ounces, with a zone edge accuracy of plus or minus 1/3 ounce. One-hundred percent in-line checkweighing speeds up to 40 items per minute can be attained. The simplified methods of precision adjustments and weight settings are also described.

To obtain this folder on the Toledo 9460 Automatic Checkweigher, circle Number 8 on CF's Information Service Card, page 39.

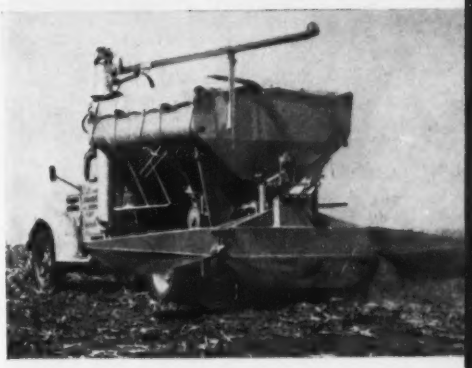
New Surge Bin

Rapids Machinery Company has announced the development of the Marion Surge Bin, designed for continuous mixing operations. The surge bin used in conjunction with the Marion Horizontal Mixer provides greater mixing capacity for the amount of space used. It bolts directly to the mixer frame providing easy installation, and is joined to the sides of the mixer by metal panels. The special heavy duty screw conveyor can be driven from a mixer rear shaft extension or equipped with a separate drive.

Three discharge gates operated by a single air cylinder provide a quick discharge from the mixing unit into the surge bin. A large 20" - 20" inspection door is also provided in the surge bin end.

Capacities up to 310 cubic feet can be handled when used in conjunction with the Marion 3-ton Mixer.

Further information can be obtained by circling Number 9 on CF's Information Service Card, page 39.



Fertilizer-Feed Truck

The first combination bulk feed and fertilizer body in the industry is the new Feedilizer just introduced by Simonsen Manufacturing Company.

This versatile 3,800-pound all-steel body can give the operator an extra fertilizer spreader during the rush season. It can also allow the dealer to expand his operation from the relatively short fertilizer spreading season to a full 12 months by adding bulk feed delivery—all with the same piece of equipment.

The 'Feedilizer' is actually two complete bodies in one, with a total capacity of 261 cubic feet. Its two compartments will hold 8½ tons of fertilizer or 5.2 tons of feed. This allows splitting a load into two separate orders of fertilizer at a time or separate feed orders. One compartment may be filled with fertilizer and the other with feed.

The fertilizer spreader unit on the Feedilizer is designed to spread accurately down to 75 pounds per acre. Because its apron is run by a wheel drive, the truck can be operated in all gears or with a two-speed axle without affecting the rate of fertilizer spread. Stainless steel is used at all critical points on the Feedilizer to reduce corrosion.

Further information and specifications on this unique new Feedilizer may be obtained by circling Number 10 on CF's Information Service card, page 39.

Sturtevant Processing Catalog

An eight-page color catalog, illustrating and describing Sturtevant Mill Company's full line of dry processing equipment now is available.

Included in the catalog is the new Sturtevant Pulver-Mill®, introduced to industry in May of this year, plus information on air separators, blenders, mixers, crushing and milling machines, Micronizer® fluid energy grinding mills, granulators, dens and excavators and other fertilizer industry equipment as well as laboratory units produced by the manufacturer.

For a free copy, circle Number 11 on CF's Information Service card, page 39.

Equipment News . . .

Bulk Truck Lift and Dump

A new dumper that lifts and dumps complete inplant bulk trucks has been introduced by Conveyors and Dumpers, Inc. The unit is designed for rapid, low-cost batch loading of mixing, grinding and pulverizing machinery or other process equipment. It permits the truck to be filled and weighed remote from the receiving vessel.

The dumper is available in capacities up to 3,000 pounds and dumping heights to 50 feet. It is furnished in portable and stationary models. Although of standardized design, it can be varied to accommodate almost any size truck as well as a variety of containers. This equipment is one of four basic dumper models which the company builds to lift and dump drums, barrels, boxes, bags and inplant containers.

For full details, circle number 12 on CF's Information Service card, page 39.

Automatic Bulk Scale

Specifications and performance characteristics of the E-50, automatic bulk scale for consecutive or cumulative process weighing by batch or continuous operation, are set forth in a six-page bulletin in color recently reissued by Richardson Scale Co.

Eight photographs and seven line drawings are employed to illustrate special features, indicate dimensions and structural arrangements, and suggest methods of application and installation. Optional equipment is described, and some of the materials that have been handled effectively by the E-50 are listed. Scale sizes available in terms of capacity are shown in a chart.

For a copy, circle Number 13, on CF's Information Service Card, page 39.

Two Chain Belt Handbooks

Just off the press at Chain Belt are two new handbooks outlining installation, operation and maintenance procedures for chain drives (bulletin 59126), and chain conveyors and elevators (bulletin 59127).

Both bulletins are handy pocket-size editions containing up-to-date, practical information on how to install, operate, maintain and extend the life of your chain drives and conveyors. They present the do's and don'ts the experts follow and are pointedly illustrated for complete understanding. Bulletins 59126 and 59127 are must reading for those interested in guarding against costly down time and premature replacement.

For your free copy of these bulletins, circle Number 14, on CF's Information Service Card, page 39.

Heavy Tractor Shovel

The new Model TL-16 TractoLoader, announced by Allis-Chalmers Mfg. Co., weighs 18,000 lbs. and has a carry capacity of 7,000 lbs. Available for use with the new unit are five rugged buckets, ranging in size from 1½ to 4 cubic yards.

For rapid loading, buckets tip back 40° at ground level. For additional stability while traveling, the buckets tip back at an angle of 45° when at carry height (14 inches above the ground). Depending upon bucket size, dumping clearance under the bucket cutting edge ranges from 8 ft. ½ in. to 9 ft. 3 in.

The TL-16 TractoLoader can be obtained with either a 109 HP Hercules gasoline engine, or a 104 HP Allis-Chalmers diesel engine. Top travel speed of the unit in either forward or reverse is 27 miles per hour.

It is equipped with a single stage 3.5 to 1 ratio torque converter, rear wheel power steering, 4-wheel power brakes that can be operated by either right or left foot, and a separate positive-locking mechanical parking brake.

For further details, circle Number 15 on CF's Information Service card, page 39.

Pneumatic Conveyors

A new complete line of pneumatic conveying systems is announced by Young Machinery Company, in a new eight page bulletin which illustrates component parts including Blow-thru and Vertical Discharge Rotary Air Lock Feeders, Positive Displacement Blowers, Centrifugal Blowers, Separators, Rotary Diverter Valves, Control Panels, etc.

This new bulletin illustrates a variety of systems for transferring bulk shipments to storage, for inplant handling, and for bulk loading of railroad cars, trucks, or containers.

The bulletin describes low pressure - small capacity pneumatic conveying systems, closed circuit systems, and high pressure fluidizing type systems.

For Bulletin P-259, circle Number 16 on CF's Information Service Card, page 39.

Specific Gravity Instrument

New Bulletin 18S, just prepared by Schutte and Koerting Company, describes the company's specific gravity indicators for continuous measurement of liquid specific gravity.

These instruments eliminate manual sampling and hazards of sampling and transporting hot or corrosive liquids. Within pressure rating of the instruments, they can be applied to measure specific gravities of liquids in systems at temperatures above their atmospheric boiling points.

The liquid flows through the Specific Gravity Indicator in a continuous stream, contacting a float-type hydrometer and a thermometer. At a glance the specific gravity and temperature are read. The instrument is adapted from the SK "Safeguard" Rotameter with which many components are interchangeable. Liquid-contacting parts are stocked in steel construction, but also a wide range of corrosive-resistant materials is used for parts in contact with the liquid being measured.

The Bulletin presents complete construction details, plus dimensional and cross-sectional drawings to illustrate the simplicity and ease-in-use of the instrument.

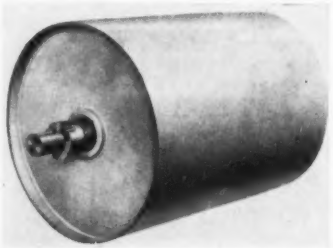
Copies of Bulletin 18S can be obtained by circling Number 17 on CF's Information Service Card, page 39.

Welded Steel Pulley Book

Link-Belt's Book 2540, "Die Crown Welded Steel Pulleys," describes a new hydro-expansion-formed belt conveyor pulley that increases conveyor belt life, has a 25 per cent greater strength, is concentric to within .030 inches and is free from crown welds.

The Die Crown welded steel pulley is formed in a die by hydraulic pressures for accurate control of crown contour and pulley diameter. In contrast to conventional crown-faced pulleys, the new pulleys are free from back-up welding bars that unbalance pulleys and add stresses and strains to the structure. Belts are more easily trained on the formed crown and true centering aids in initial belt settings.

The new publication gives detailed engineering and selection data. Information on lagged pulleys, shaft and pulley assemblies is also given. A free copy of the new 8-page, Book 2540, "Die Crown Welded Steel Pulleys," can be secured by circling Number 18 on CF's Information Service card, page 39.



Stepped-end Multiwalls

New stepped-end multiwall shipping bags, made especially for fertilizers, chemicals, insecticides and building materials, are announced by Ames Harris Neville Co., Berkeley, Calif., maker of bags for agricultural and commercial purposes.

The new bags are built with an especially large valve to speed spout filling. The valve tucks in after filling to effectively prevent sifting or leakage. Because of their squared ends, the bags are easy to handle, lie flatter, are easy to stack and palletize.

Anti-skid surfaces are available without upcharge. An easy-opener ter strip, recently developed by Ames Harris Neville Co., can be incorporated in the new bags.

For further details, cricle Number 19 on CF's Information Service card, page 39.

'Pulver-Mill' Literature

Literature on the new Sturtevant Pulver-Mill®, a vertical impact mill with an integral air classifier, introduced to industry last month, is now available from Sturtevant Mill Company. The literature includes a flowsheet and operating information on the new unit, which can handle up to two and a half tons an hour of soft, non-metallic materials.

The mill offers three Sturtevant-engineered patent-pending firsts — double-impacting grinding, exclusive deflector wall construction to 'bounce' partially ground material back into the grinding zone while speeding grinding, and adjustable air classification providing for precise end-product selection.

For copy of the bulletin circle Number 20 on CF's Information Service Card, page 39.

Liquid Applicator For Orchards

General Metals, Inc., designers and manufacturers of equipment for liquid fertilizers, is now offering a new applicator designed especially for applying nitrogen solutions and complete liquid fertilizers to orchards. Trailer Applicator Model 450 is equally effective in all types of orchards and orchards of all ages, and has been completely field tested. A number of units are already in use.

Applicator Model 450 consists of a rugged trailer frame, special boom, heavy-duty tank saddles, 235-gallon aluminum or 200-gallon stainless steel tank, Dempster metering pump, front end jack and a special shield to prevent limbs from getting caught in the applicator and doing damage to trees.

After much experimental work with peach, cherry and apricot orchards, it was found that a boom on one side only is best, due to varying widths of rows, as the driver can do a faster and easier job just watching one side.

Spray nozzles on the boom are divided into three sections lengthwise. One, two or all three sections can be used to take care of trees of various sizes. The boom is 'weightless' (skids along the ground with practically no weight) due to special spring design which also causes the boom to spring back when it strikes an obstacle such as a tree trunk or fruit box. The boom is shielded to avoid intanglement and has a rubber bumper near the end to avoid de-barking any tree that might be hit. The boom is raised against the side of the applicator for road travel. General Metals standard 21' or 28' boom can be adapted to this trailer, making the unit an excellent applicator for pasture and small grain.

Fertilizer solution is metered through a Dempster Model SN positive displacement piston pump, featuring 'dial the rate of application' which will handle nitrogen solutions, complete liquid fertilizers, herbicides, insecticides and other farm chemicals. A simple on-off clutch for starting or stopping the pump

Equipment News . . .

can be operated by a rope from the tractor. The pump is driven from the ground wheel of the trailer by roller chain.

Ends of the pressure tanks are flanged and dished for maximum strength, made to 30 PSI working pressure, according to ASME specifications. Measuring gauges on each end of the tank are calibrated in one quarter of a gallon; sure measurements, even on unlevel ground, are made by reading gauge at each end and taking the average between them.

For complete information on Orchard Applicator Model 450, circle Number 21 on CF's Information Service Card, page 39.

Fiberglass Sprayer Tanks

Hanson Equipment Company now offers a complete line of Fiberglass sprayer tanks ranging in size from 50 to 500 gallons and in a variety of shapes to suit individual needs. Fiberglass, well-known as a tough, lightweight, resilient material is impervious to the highly corrosive action of modern farm chemicals and rust; these rugged sprayer tanks will withstand sharp blows without denting or breaking. Translucent tank walls allow you to see the liquid level at all times with handy sight gauge for reference at either end.

Full information on the complete line of Fiberglass tanks may be obtained by circling Number 22 on CF's Information Service Card, page 39.

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Equipment News . . .

Versatile Spray Jet

The wide swath spray required in broadcast spraying may now be completely controlled and varied to meet wind and field conditions without leaving the tractor seat, according to Spraying Systems Co. whose new DirectoJet is designed with a control valve that provides spray to either the left or right side of the tractor, or to both sides at one time. Since spray may be shut-off to either right or left, the spray can be set in the "down-wind" direction on windy days. This control feature is also of advantage when spraying near fence rows or buildings. For normal spraying, the DirectoJet may be set to spray to both sides at once.

The DirectoJet offers a choice of five different capacity ranges. The valve assembly is made of aluminum and stainless steel with nylon packings for maximum resistance to chemicals. Application of this new unit includes the broadcast spraying of grains and grasses, and the spraying of liquid fertilizers . . . wherever the accuracy of a spray boom is not required. For complete information get Bulletin 99 by circling Number 23 on CF's Information Service card, page 39.

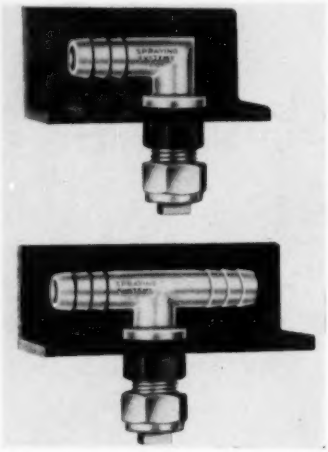
New Hough 5000-lb. Shovel

Frank G. Hough Co. has just announced a new four-wheel-drive, rubber-tired tractor shovel with 5,000 lbs. carry capacity, the Model H-50. This loader is already in production and will replace the Model HU 'Payloader.'

Features of the new H-50 include more power available for both hydraulics and traction, more efficient torque-converter, complete power-shift transmission, power-transfer differentials, power-steering, pry-out bucket action, safety boom arms, power-boosted brakes and numerous refinements. The new and more powerful gasoline and diesel engines provide from 90 to 92 hp.

To assure ample protection of the engine in dusty conditions, the H-50 has a large-capacity oil-bath air cleaner. A cartridge-type oil filter is built into the hydraulic reservoir. Similar filters protect the engine oil, and the transmission and torque-converter oil. The front service brakes are sealed to keep out dust, dirt and foreign matter.

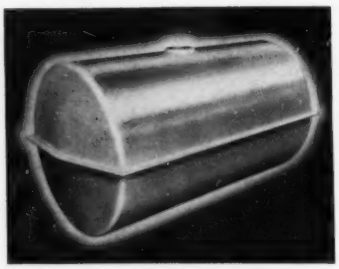
Literature and complete specifications on this new unit may be obtained by circling Number 24 on CF's Information Service card, page 39.



Nylon Hose-Shank Spray Nozzles

A new type of TeeJet Spray Nozzle has been introduced by Spraying Systems Co. permitting the fabricating of a spray boom from an angle-iron instead of piping. The nozzles are mounted in holes drilled in an angle-iron at desired intervals and the hose shanks are connected by hose to make up a complete boom. These nozzles are supplied with double and single hose shank bodies for inside and end positioning on the boom.

The complete nozzle consists of hose shank, nozzle body, cap and strainer body made of nylon, with strainer screen in stainless steel and orifice tips in either aluminum or stainless steel. The assembly is held in position on the angle-iron by a lock nut. Use of nylon as a material provides resistance to almost all agricultural chemicals including balanced mixed fertilizers. For complete information on these new Hose-Shank TeeJet Spray Nozzles in Data Sheet 8120, just circle Number 25 on CF's Information Service Card, page 39.



Fiber Glass Tank

A new molded fiber glass tank for use in spraying or storing corrosive liquids is announced by the Molded Fiber Glass Body Company.

Designed in a cylindrical shape, the new 200-gallon tank is resistant to corrosion and weathering, and is recommended for use as a spray tank for insecticides and liquid fertilizers, or as a storage tank for chemicals.

The new molded fiber glass tank is easy to clean, lightweight and impact resistant, is 58" long with a 32" diameter. Available in a selection of colors, the tank is translucent so that the liquid level is always visible.

Because the tank is economically mass-produced in matched metal dies, it is claimed to cost less than corrosion-resistant metal tanks of comparable size.

For information circle Number 26 on CF's Information Service Card, page 39.

Processing Equipment Catalog

Bauer processing equipment for various industries is illustrated and described in the new, 4-page Bulletin No. 59, recently released by The Bauer Bros. Co.

Equipment shown for use in pulverizing, fiberizing, granulating and blending various materials includes Bauer hammer mills, double and single disc attrition mills, single and double roll crushers and magnetic separators.

For your copy, circle Number 27 on CF's Information Service card, page 39.

Lift Truck Operator Manual

Automatic Transportation Company has published a new Instructors' Manual to be used as a guide for Industrial Truck Operators' Training Program. Driver training pays dividends in safety, economy, efficiency, on-the-job time, lower maintenance costs and better plant operation.

This 20-page booklet is divided into six stages: theory of operation; good driving practices; details of construction in principal types of trucks; practical operation of the truck; demonstration and written examination for the driver trainee.

Cartoons are also included to show how accidents happen and how to prevent them.

Copies of the Instructors' Manual are available by circling Number 28 on CF's Information Service card, page 39.

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Commercial Fertilizer and Plant Food Industry

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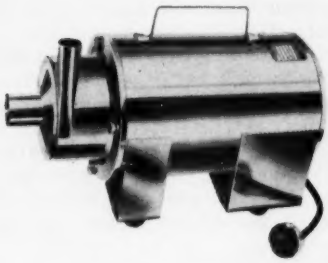
Equipment News . . .



All-Stainless Pump

A wide variety of chemical solutions may be handled with a new all-stainless centrifugal pump recently introduced by Stainless Steel Pump Co. The use of 316 stainless steel throughout provides a unit offering excellent corrosion resistance for most chemical applications.

Compactly built, the pump is powered by a continuous duty, ¾ H. P., single phase, 115/230 volt, 60 cycle, jet pump motor equipped with automatic overload protection.

The pump is extremely portable; measures 14" x 8" and weighs only 30 pounds. A unique impeller design provides a capacity of 50 gallons per minute at 20 psi.

Standard inlet is 1½" O.D. stainless steel tubing . . . outlet is 1" O.D. stainless and may be positioned vertically or horizontally. Can be furnished with any type inlet or outlet fitting.

For literature and complete details circle Number 29 on CF's Information Service card, page 39.

Strip Chart Recorder

An improved four inch strip chart recorder and recorder controller have just been introduced by Fischer & Porter Company.

The new instrument, known as the Mark III line, feature a modified inking system that provides a full month's record without refill. The new pen mechanism provides a bolder, more uniform line over the entire chart width. Reinking can be accomplished without interfering with movement of pen parts. In addition to the new inking system, the Mark III recorder-controller features a flip-switch for reversing controller action from air to open to air to close.

Other new features of the F&P Mark III instruments include wide visibility plastic door, built-in damping of pneumatic input signals, fused chart motor, and bolder easier-to-read scales with larger high intensity colored pointers. Control station knobs are larger and can be operated even with gloves on. In addition to these newly-incorporated design modification, the F&P Recorder and Recorder-Controller retain previous features as follows: four inch rectilinear chart; fourteen hours visible chart record; complete accessibility to, and removal of, chassis without disturbing process even while operating in automatic control; interchangeability of indicating and recording chassis; universal manifold design for either plug-in or remote control controller; lifetime-calibrated Ni-Span C measuring capsules; continuous valve pressure indication.

For more information, circle Number 30 on CF's Information Service card, page 39.

Air Vibrator Bulletin

A new four-page bulletin detailing applications of their one-piece air vibrator has just been announced by The National Air Vibrator Company.

Navco Air Vibrators are used for moving bulk materials through hoppers, bins, and chutes. Models are illustrated operating successfully in hazardous atmospheres, extreme moisture conditions, outside in severe weather, and in magnetic dust conditions. Specifications and mounting information on eight different Navco models are included.

Copies of Catalog 303 may be obtained by circling Number 31 on CF's Information Service Card, page 39.

Large Tractor Shovel

Model W-10, newest addition to the Terraload'r line, has just been released to dealers by J. I. Case Co. The 4-wheel drive, rear-wheel steer tractor-shovel has a carry capacity of 6,500 lbs. at 4 mph. Standard bucket size is 2 cu. yds. SAE rated, with a 1¼ cu. yd. heavy-duty bucket, and a 2⅞ cu. yd. light materials bucket optional. Lift capacity at 0 mph is 13,000 lbs.

Machine balance is exceptionally good. The rear wheels carry over 40 percent more empty weight than the front wheels, providing greater digging traction with less bucking, as well as greater stability for carrying heavy loads at high speeds.

A safety feature is the mounting of all moving loader parts ahead of the operator. This arrangement gives unequalled visibility, increases operator safety, and makes it possible to enter or leave the operator's compartment with the bucket fully raised.

For full information, circle Number 32 on CF's Information Service card, page 39.

All-direction Fork Lift

Automatic Transportation has introduced their new Transveyor "Crab" truck, answer to unusual material handling problems. This Universal truck has Stero-Matic steering which permits traversing in any direction, at any angle, with any shaped load.

Stero-Matic steering and twin drive motors are operated by one control lever which provides forward and reverse turning without use of the steering wheel. Angle and side steering will be controlled by the steering wheel. The "Crab" truck is easier to steer in tight aisles, steer around corners and right angle stack.

Additional information on the Transveyor "Crab" truck is available by circling Number 33 on CF's Information Service card, page 39.

New Bag Flattener

New London Engineering Company has just introduced a versatile new bag flattener. Designated the Model BB12Ex8' Type 32, this unit is designed to flatten bags as they come from filling machines, to assure firm, safe stacking or palletizing, and storage in the least space possible. The upper belt can be adjusted to the desired minimum position above the lower belt and several different bag sizes can be flattened without changing the adjustment. The exact amount of compression required is achieved by simply adding weight to the shelf on the upper belt.

The Type 32 Bag Flattener is available in belt widths from 8" to 24" and is priced from $578.00 complete, depending on belt width and horsepower required.

Further information and literature is available by circling Number 34 on CF's Information Service Card, page 39.

Cast Iron Pulleys Book

A new illustrated bulletin on Blue Face cast iron pulleys has been announced by Sprout, Waldron & Company.

In addition to close-up photographs of various type pulleys, Bulletin 33-A provides complete specifications concerning diameter, face width, crown, rim thickness, hub, keyseats and set screws, arms, balance, etc. A complete table of weights for both single arm and double arm pulleys is also included.

An interesting feature of this bulletin is a series of simplified sketches showing how to specify pulleys when ordering. Copies are available by circling Number 35 on CF's Information Service card, page 39.

Sift-Proof Bags

The Automatic Flav-O-Tainer, a sift-proof bag with heat-sealed conconstruction and a flat block bottom, is now being offered by the Flexible Packaging Division of Continental Can Company in larger capacities ranging up to 25 pounds.

Ideally suited to protectively packing and shipping hygroscopic products and finely powdered materials, these economical flexible packages are the first intermediate sized bags to be offered in the automatic style.

Further information may be obtained by circling Number 36 on CF's Informaiton Service card, page 39.

RESEARCH RESULTS AND REPORTS

Soil moisture loss—which accounts for more, crop growth or evaporation? In some corn fields at Morris, Minn. last summer the use was about half and half, a team of researchers learned.

They also found that if soil moisture isn't adequate by the first week of July, rainfall after that isn't apt to be enough to pull the crop through.

USDA soil chemist R. F. Holt made the studies in cooperation with George Blake, University of Minnesota soil physicist, and Roy Thompson, agronomist at the West Central Experiment station.

In corn that grew to maturity, Holt found that moisture loss from the soil totalled 10.14 inches from the end of June until harvest time. Where no corn was growing, the soil lost 5.10 inches of moisture—most of which clearly was due to evaporation. So he concluded that evaporation loss and use by the plant were about equal.

Holt double-checked this another way: In some growing corn, he covered the soil with plastic to prevent all evaporation loss. Total moisture loss in this case was about half of where there was no plastic.

These were preliminary studies and are part of long-time research on moisture problems and ways farmers can deal with them.

Sugar beet research in California is demonstrating the value of N and P on that crop. Dr. Albert Ulrich, Dr. David Ririe, F. J. Hills, Morton D. Morse, and Dr. Clarence M. Johnson, all on the staff of the University of California recently produced Bulletin 766 of the Experiment Station, entitled "Plant Analysis, a Guide for Sugar Beet Fertilization, and Analytical Methods for use in Plant Analysis," a comprehensive treatise on the subject.

The Bulletin states that "Nitrogen fertilizers are required for good sugar beet production in nearly all our beet growing areas," and that "profitable responses to phosphorus fertilization are becoming more common in California. We can expect the need for phosphorus fertilizers to increase," though it points out that present phosphorus needs are not yet general.

It reports that proper timing of nitrogen application is very important, so as to insure sturdy plant and root growth, and at the same time, the maximum percentage of sugar content. When nitrogen is applied late in the growing season it contributes to a decline in sucrose concentration in the roots, if harvested while the plants contain high amounts of nitrogen.

Dr. Robert F. Loomis of the Department of Agronomy, in another article recently said that it is essential, with present beet varieties, that they be allowed about 30 days of nitrogen deficency just before harvest. During this period, growth is reduced, and sugar that would have been used in producing a larger root is now stored in the root, with a higher sucrose percentage resulting."

The authors of Bulletin 766 said that every field presents a different fertilization problem, but that experience has shown that "most beet crops that respond to nitrogen applications at all can usually use at least 80 pounds of nitrogen per acre. Rates approximating this amount, therefore, are logical to start with."

Lawn Disease retreats under atomic bombardment. Federal researchers have produced a basic genetic change in bluegrass by shooting neutrons into the seed. Offspring are resistant to stem rust, a lawn-shriveling blue-grass ailment. Botanists hope to cause beneficial changes in other domestic plants and farm crops; the treatment may save years of tedious cross-breeding.

Chlorosis—the yellowing of foliage in ornamental trees and shrubs—can now be quickly controlled, according to an Oklahoma AES study. Because the major cause is an iron deficiency, the use of chelated iron, or other iron-containing products gives practical control in a few weeks time. Foliar treatment is temporary in effect. Aqueous iron applied directly into the trunk gives quick, lasting results, by-passes the soil which may hold back some of the iron.

Fruit Trees. A recent study by John Titus, University of Illinois, shows the following facts about fruit tree fertilization: Peach trees growing on sod require twice the normal N application. Heavy application of N on Golden Delicious apples delays maturing. Fruit trees on manganese-toxic soils accumulate 50 times the needed amount of this mineral.

Barley culture research by Agriculture Research Service in Arizona shows new information on the effects of irrigation, rate of N application and application timing. Dr. Henry A. Schreiber reports on tests with California Mariout barley planted in loamy fine sand in December of 1957 and harvested the following June. "By varying the timing of the nitrogen application it was shown possible to vary several important features of barley growth," he said.

"The best yields (two tons of grain per acre) resulted from the use of 240 pounds of nitrogen fertilizer per acre in three split applications with no stress for moisture." Dr. Schreiber added that the same result could be produced by concentrating the fertilizer into two split applications of 120 pounds each at planting and early boot (appearance of the awn).

The only way maximum yield could be achieved with a single application was by applying fertilizer at planting and withholding irrigation until the boot stage, according to Dr. Schreiber. "It was interesting to note," he said, "that applying water at the earlier stage or delaying the single application of fertilizer to a later stage of plant development, were both wasteful and detrimental."

"From studies such as this," Dr. Schreiber continued, "a formula may be derived to determine exactly when to apply nitrogen and water to barley for maximum yield at the least cost to the farmer. If water and nitrogen are in rather short supply, it is important to know the times when it is most critical to utilize these production factors."

The data from these tests are still being examined and more work is underway to add to and verify the preliminary findings.

Gibberellic acid research has turned up two more effects of the "wonder chemical" on plants. It causes a plant both to take up more phosphorus and to lose water more rapidly. This research is reported from

Speed handling, reduce pile set with Du Pont URAMON® Ammonia Liquors

You can keep production fast-moving and your fertilizer free-flowing with the added conditioning benefits of Du Pont "Uramon" Ammonia Liquors.

UAL helps to prevent the cementing, pile-setting action that often results from some other nitrogen formulations. As mixtures ammoniated with UAL cool, residual moisture combines with the compounds formed—leaving a dry mix remarkably free of excessive caking, segregation and dusting. Result—your UAL goods suffer less pile set, seldom require blasting and can be moved readily by the payloader.

In addition, Du Pont "Uramon" Ammonia Liquors are non-corrosive, can be used in ordinary steel equipment. Secondary set and caking in the bags are also minimized because the urea from UAL is non-reactive with other fertilizer ingredients. And UAL mixtures are highly drillable.

After application, the extra fertilizing benefits of UAL begin. UAL provides nitrogen in both the urea and ammonium form—nitrogen that becomes available at a rate closely paralleling plant requirements. Nitrogen from Du Pont UAL is also leach-resistant; remains in the root zone long after other forms have been exhausted.

Du Pont UAL is available in five forms, including UAL-37 for even more gradual nitrogen release, and UAL-S with the added conditioning effects of ammonium sulfate. For information on which type is best suited to your needs, write Du Pont.

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URAMON®
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BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Chuck Painter (left) soils extension specialist and F. Todd Tremblay, regional director of the National Plant Food Institute inspect an excellent field of alfalfa in Idaho on their soil-analysis plant-analysis survey of alfalfa fields in various Idaho counties. About 120 samples equivalent to approximately 8000 acres were taken just prior to the first cutting of alfalfa.

the University of Minnesota by botanists Linck and Sudia.

In one test, they put bean plant roots in gibberellic acid solutions, added radioactive phosphorus (P-32) and checked plants 28, 52 and 76 hours later with a Geiger counter.

In all cases, plants treated with the chemical had absorbed more phosphorus than non-treated ones. Gibberellic acid also affected the phosphorus distribution; after 76 hours, for example, upper stems of treated plants had four times as much phosphorus as non-treated ones. In new leaves, though, gibberellic acid only doubled the amount of phosphorus.

Rotational grazing has been demonstrated lower in cost and is voted best of the three methods tried by USDA at Beltsville with improved grass-legume pasture.

Other methods tested were strip grazing on plots large enough to provide a day's forage for a specific number of cows, and "soiling," in which forage is mechanically harvested daily and fed green to cows in barns or drylots. Rotational grazing cost less because it required no portable electric fences or labor to move them daily as did strip grazing, and there was no harvesting or handling of forage each day as in soiling.

Rotational and strip grazing under proper management were equally efficient in forage utilization and significantly better than the soiling system because the grazing systems supported the same number of cows for more days per acre. None of the three methods used experimentally, however, caused a material change in milk production or the liveweight of the test animals.

Forage production can be tripled by annual application of NP fertilizer over unfertilized range land according to results at the Pleasanton Plant Materials Center in California, reported by Manager O. K. Hoglund.

He bases his observations and recommendations on results from fertilizer trials conducted over a 15-year period at Sunol, a site representative of about 1½ million acres of annual range in California.

"From these tests we noted that fertilization increased hay production by about 2882 pounds each year. In other words, each pound of nitrogen when applied with phosphate produced over five extra pounds of beef," Mr. Hoglund said. "These yields were obtained from an annual application of 200 pounds of fertilizer per acre."

He added that this rate of application advanced the date of grazing readiness by six weeks and doubled the length of the green feed period. "With an application of 1000 pounds of fertilizer per acre, grass will mature up to twelve weeks earlier," he stated.

Other striking results of these fertilizer trials were the reduction of fluctuation in production of forage from year to year, and the improvement of "frost hardiness" or the ability of plants to live and grow during the frosty winter months. Mr. Hoglund recommended fall fertilization with a nitrogen-phosphate fertilizer to reduce the amount of tip burning by frost. He said that fertilization also helped produce an adequate cover for control of erosion and for conservation of water.

Poisoned Oceans A War Weapon

A chemical fertilizer plant dumped wastes into a Pacific Coast Bay in 1953 and caused a large toll of lives in Japan among persons eating fish caught in those waters. This suggests that poisoning of coastal waters can be a significant military weapon, according to Dr. Bruce Halstead of the World Life Institute, reporting at the American Society of Limnology and Oceanography. It seems the fertilizer plant wastes were absorbed by sea plants, which fish eat.

Kit Identifies Nutrient Lack

A kit which permits easy identification of deficiency symptoms in crops has been created and is now offered for sale by Plant Science Products Co., P. O. Box 770, Berkeley 1, California under a money-back guarantee. The kit includes color pictures of plants, showing the normal plant and how it looks with various deficiencies — covering 12 plant food elements, major and trace.

With the kit come packets of the various food elements so that tentative diagnosis from the pictures can be confirmed by foliar treatment. It is suggested that field men carry the kit in their cars at all times, and that farmers, nurserymen, gardeners and plant hobbyists keep a kit on hand. The Profit Diagnostic Kit sells for $7.95 each, postpaid.

Danger in Pesticides?

A consultant at Mayo Clinic, Dr. Malcolm M. Hargraves, is quoted as warning of danger in the widespread use of the "powerful new" pesticides. Case histories, he reports, indicate an association between hydrocarbon insecticides and blood diseases such as aplastic anemia, leukemia and the lymphomas in susceptible persons.

Garlic is Plant Tonic

From the University of California comes word that garlic juice diluted with water can knock out some of the more troublesome ailments of growing fruits and vegetables . . . and fortunately the mixture can be made to smell as sweet as roses, they tell us, by use of alpha neutroleum (commonly used to neutralize odors of garbage cans and such). Applications are by spray of 10 to 20% garlic powder or juice. 50% powdered garlic and 50% of fine powdered claylike material can also be used for dusting application.

MEETING BRIEFS

August 18-22 Canadian Fertilizer Association will hold its 14th annual convention at Bigwin Inn, in the Lake of Bays District, Muskoka — just 140 miles north of Toronto. A road map and other information on reaching the convention site will be sent if you write Alexander Mooney, convention chairman, Canada Packers Ltd., 2200 St. Clair Ave. West, Toronto 9, Ontario. The setting in the highlands of Ontario is said to be very beautiful. An excellent golf course, swimming and many other features make this a delightful combined business and vacation trip.

September 15-17—The 7th annual University of Florida Turf-Grass Management conference and field day will be held in Dan McCarty Hall on the University campus. Three types of sessions will be featured: A classroom approach to the fundamentals; a discussion session on various subjects pertinent to the delegate's own field; a session on new developments and progress in research. A field day program will include visits to turf research plots. The Florida Turf Association will elect officers during the three-day meeting.

September 24-25. NPFI is broadening the scope of its former New England fertilizer conference, by holding it in New York at the Biltmore Hotel, and including the whole Northeast in its range. September 24 will be a half-day afternoon session, including a report of Institute activities in the region, presided over by E. R. Jones of Hubbard-Hall. The September 25 program puts emphasis on forage production possibilities in the region. T. R. Cox of Cyanamid, chairman of NPFI's Northeast Research and Education committee, will preside. Write Dr. W. H. Garman at NPFI, 1700 K St., N.W., Washington, D. C. for reservation card, which then should go direct to the Biltmore.

November 4-6. The Fertilizer Industry Round Table will meet at the Mayflower Hotel in Washington with the meeting theme "Practical Problems in Processing pHertilizers." Two well known and experienced operators will discuss their plant layouts, processes, mistakes to avoid, good features to accentuate—in other words a detailed description of the two plants from raw materials to shipment. These men will be ready to answer questions, and there will be plenty of question time reserved. Two noted statisticians will discuss statistical quality control. Problems of conventional fertilizer manufacture will be discussed. Preneutralization will have a symposium to discuss this subject of universal industry interest. For more details, write Dr. Vincent Sauchelli, at NPFI. (See address in item above.)

The old and the new. A "whirlybird" fitted with hoppers for dispensing fertilizers and pesticides hovers with precision control over a tractor and broadcast-spreader during a demonstration at the Northwestern meeting, American Society of Agronomy, at the University of Delaware. Some 135 agronomists from 13 states saw the 'copter easily and quickly spread du Pont's "Nugreen" fertilizer compound (urea-nitrogen) on a pasture and "Dybar" fenuron weed and brush killer on a hedgerow. The pilot of the helicopter is Charles Mark of Agrotors, Inc., Gettysburg, Pa., and the tractor operator is Frank Springer, Jr., member of the University's agronomy department, host for the meeting.

George Mason (left) president of the Montana Plant Food Association and Warren Stensland, secretary-treasurer (right) discuss yield responses of native hay to fertilizer treatments with Bernie Brown, M.S.C. extension soils specialist and Harry Kittams, assistant soil scientist of M.S.C. The fertility research on native hays was supported by a grant from the National Plant Food Institute.

MONTANA ASSOCIATION

Members of the Montana Plant Food Association at their second annual summer convention heard about the latest soil and fertilizer research by a team from Montana State College.

Harry Kittams, assistant soil scientist at Montana State College, reported that fertility trials on native hay land produced economic yield responses in all but one location of the 13 experimental trials. He pointed out that wherever the phosphate supply of the soil was low, the use of nitrogen and phosphate together resulted in the greatest net profit per acre. "Stands containing a large percentage of grass responded best to nitrogen applications, but grass legume stands responded best to both nitrogen and phosphorus, particularly where the soil phosphate was low," Kittams said.

Murray Klages, assistant soil scientist at the College said that plans to move the soil testing lab from the chemistry department into the soils department were just about completed. "We hope that this new soil testing set-tup will enable us to give better service to the farmers in the state and result in a closer relationship between research and field application of the data," he said. "We have a lot to learn about the fertility status of Montana soils and an intensified soil testing program should help us to find out where the main fertility problems are located."

Other speakers from Montana State College included Dr. J. C. Hide, John Rouse, and Bernard L. Broom.

F. Todd Tremblay, Pacific Northwest regional director of the Nation-

al Plant Food Institute, spoke to the group about banker-dealer relationships. "The smart fertilizer dealer soon finds out that the banker can be of substantial assistance in getting the farmer on the right track as far as a fertility program is concerned," he said. "The banker is usually ready, willing and able to push the college program of soil fertility, but someone must first approach him with the dollars and cents aspect of such a program. This is the job of the extension service, the dealer, and the Institute.

GEORGIA SOCIETY

Attendance exceeded 475 at a series of six summer meetings of Georgia Plant Food Educational Society. Meetings were centered around grazing and feed production programs, and were held wherever possible on the farms of district award winners in the annual grazing and feed production contest.

A tour of the farm and study of farm management and fertilizer practices preceded each luncheon meeting, where awards were presented for the district. PFES president Tony Dozier of Macon and secretary-treasurer J. Fielding Reed of Atlanta were prominent on and behind the programs.

Aided by other members of the Extension staff, J. R. Johnson, Extension agronomist and project leader, pointed out changing fertilizer and crop-use trends in the state. A survey of county agents estimates of 1958 fertilizer use was presented, indicating that corn accounted for 43.7% of Georgia's plant nutrient consumption. Temporary pasture used 17.6%, permanent pasture 15.9%, and cotton only 8.4%. Other crops and their percentages were: truck crops, 4%; peanuts, 3.6%; oats, 2.7%; tobacco, 2.3%; wheat, 1%; and soybeans, 0.8%.

An appraisal of potential increased fertilizer use showed that the state can use an additional 174,444 tons of N, 57,383 tons of P_2O_5, and 100,048 tons of K_2O each year. Changing patterns of crops indicated through a projection that permanent pasture would account for 50.4% of the potential increase and temporary pasture an additional 7.5%. Corn was predicted as the end use for 29.9% of the increase, while other crops ranged individually under 5% in the summary of potential increase.

Southeastern Fertilizer Conference Announces Sept. 30-Oct. 1 Plans

Discussion of the customer, the dealer, and the tools to help sell fertilizer, all fused together, will make a stimulating potion at National Plant Food Institute's Southeastern Fertilizer Conference in Atlanta Sept. 30 and Oct. 1 at the Atlanta Biltmore Hotel.

"Research and Extension Programs and the Fertilizer Industry" will be discussed by Dr. E. T. York, director of the Alabama Agricultural Extension Service, to open the morning program.

A group of panelists will cover the subject "The Customer Needs Your Product," followed by topics on "Your Customer and You," "He Needs Your Product Because It Will Make Him Money," and "These Tools Will Help You Sell . . . Demonstrations . . . Soil Testing."

Two noted sociologists from Iowa State College, Drs. Joe Bohlen and George Beale, will talk on "Fertilizer Sales and the Fertilizer Dealer," and Dr. S. L. Tisdale, NPFI Southeastern regional director, will bring the program to a close with a presentation on "A Summary — Fertilizer Consumption in Special Program Areas."

Members of the Southern Soil Research Committee and the Southern Extension Agronomists will meet Oct. 1.

North Carolina Salesmen's School

"To help North Carolina's agriculture through better use of plant nutrients sold and distributed through the fertilizer industry." That is the preamble of a notice just released concerning the Fertilizer Salesmen's School to be held September 3 and 4 at N. C. State College Union, Raleigh. Co-chairmen are J. M. Curtis and W. C. White. It will be similar in form to the recent, highly successful Ohio school where the NPFI Salesmen's Handbook was launched—reported here recently.

1959 NORTH CAROLINA FERTILIZER SALESMEN'S SCHOOL

September 3 and 4, 1959 — N. C. State College Union, Raleigh, N. C.

Objective: To help North Carolina's agriculture through better use of plant nutrients sold and distributed through the fertilizer industry.

Co-Chairmen: J. M. Curtis and W. C. White

Thursday, September 3

Morning Program: Chairman—C. E. Bishop

8:30- 9:30	Registration in Union Lobby	E. M. Starnes
9:30- 9:45	Purpose of Conference	D. W. Colvard
9:45-10:30	What is a Good Salesman	Ralph Everett
10:30-11:00	Break	
11:00-11:45	What Are We Selling	A. P. Gates

Afternoon Program: Chairman—J. W. Fitts

1:15- 1:45	What Are Our Customers Like	M. S. Williams
1:45- 2:15	A Farmer's Viewpoint of Fertilizer Selling	R. S. Fisher
2:15- 2:45	The Sale: Bringing the Customer and Product Together	J. M. Curtis
2:45- 3:15	Break	
3:15- 3:30	Orientation for Tour	J. W. Fitts
3:30- 5:00	Tour—Department of Soils, N. C. State College	

Evening Program: Master of Ceremonies — L. Y. Ballentine

7:00	Banquet (Sir Walter Hotel)	
	Success in Selling	E. A. Fails

Friday, September 4

Chairman — D. S. Weaver

8:30- 9:30	Why Should a Farmer Buy Fertilizer	
	Increase Crop Productivity	W. C. White
	Increase Profits	W. L. Turner
9:30-10:15	Some Successful Agronomic Selling Tools	E. J. Kamprath
10:15-10:45	Break	
10:45-11:30	Public Relations: You, Your Industry, and the Public	G. H. Soule
11:30	Adjournment	

NPFI CONFERENCE on CHEMICAL CONTROL

Shoreham Hotel, Washington, D. C., October 15

The agenda for National Plant Food Institute's Conference on Chemical Control Problems has been released. The meeting is to be held at the Shoreham Hotel in Washington, D. C. October 15, immediately preceding the annual convention of the Association of American Fertilizer Control Officials. The morning session will get under way at 9:30 a.m. and adjourn at noon; the afternoon session will commence at 1:30 p.m. and be over at 4:00 p.m. The program for the sessions is as follows:

National Plant Food Institute's Conference on Chemical Control Problems, at the Shoreham Hotel, Washington, D. C., October 15

Introductory remarks—Vincent Sauchelli, chmn., NPFI.

Statistical Methods for Chemical Analysts—W. J. Youden, National Bureau of Standards.

Magruder Check Sample Statistical Analysis: How to Use the Data—E. M. Glocker, W. R. Grace & Co., Research Center.

Panel Discussion: Tolerance Levels in Chemical Fertilizer Analyses—F. W. Quackenbush, Indiana state chemist & Seed Commissioner; C. H. Perrin, research chemist, Canada Packers, Toronto; H. J. Webb, research chemist, Clemson, S. C.; and A. J. Duncan, Johns Hopkins University.

Relation of the State Regulatory Office to the Local Fertilizer Industry—R. Z. Rollins, chief, Bureau of Chemistry, California State Dept. of Agriculture.

How Management Regards the Role of the Chemical Control Laboratory—Nelson White, vice president, International Minerals & Chemical Corp.

How Firm a Foundation—John Brabson, Chemical Development Division, TVA.

ILLINOIS CONFERENCE

Nearly 150 fertilizer manufacturers, sales representatives, trade association staff members, and agronomists gathered at the Annual Fertilizer Conference at the University of Illinois, June 29-30.

Opening the Monday afternoon session, Dr. George Stanford, chief of the Soils and Fertilizer Research Branch of Tennessee Valley Authority, discussed "Frontiers in Fertilizer Research."

L. T. Kurtz, professor of soil fertility, reported on trends on fertilizers sold in Illinois. He pointed out that during the past 20 years Illinois has developed from a minor position in fertilizer use to the fourth ranking state in total nitrogen, available phosphate, and potash. When the phosphate in rock phosphate is added in, Illinois ranks first in total plant food nutrients.

Samuel R. Aldrich, professor of soils extension reported that Illinois has 80 county soil testing laboratories and 44 independent laboratories. Together they test from 500,000 to 660,000 samples each year. These samples represent about two million acres—nearly 10 percent of the harvested cropland in Illinois.

Russell T. Odell, professor of soil physics reported that two years ago Illinois pioneered in developing "Production Potentials" for the major Illinois field crops on many of the important soils. Through the cooperation of the midwest office of the National Plant Food Institute, wall charts and check lists were widely distributed to fertilizer dealers, rural bankers, county farm advisers, and vocational agriculture teachers.

During the Tuesday morning session, the group discussed fertilizer recommendations for Illinois. Eight smaller groups were given the opportunity to comment on such phases of the program as sources of data for recommendations, bulk application, role of the county farm adviser, build-up vs. liberal crop fertilization, and a fertilizer program for wheat. The comments received by the Illinois agronomists are being summarized and will be sent to the participants.

Illinois Local Level Association

During an informal session of the Illinois Fertilizer Conference, the Illinois Fertilizer Association was formed. Robert Weis, Virginia-Carolina Chemical Co., E. St. Louis, was elected president.

S. C. Fertility Program Launched

Farm income in Newberry County, South Carolina, can be increased by nearly $8,000,000 through the use of recommended amounts of fertilizer based on a soil test, it was declared by speakers at the kick-off dinner which launched an intensified soil fertility program in Newberry County.

The dinner, held in the Community Hall, was attended by 75 persons representing various segments of the county economy. It was sponsored by the National Plant Food Institute, which is supporting the program in South Carolina with a grant, in cooperation with Clemson Agricultural College and the county agents.

Among the speakers who addressed the meeting was H. A. Woodle, Leader of Agronomy Extension Work at Clemson College, who spoke on "The Value of A Soil Fertility Program in South Carolina."

The role of the Extension Service at Clemson College in the soil fertility program was explained by George B. Nutt, director.

Dr. S. L. Tisdale, Southeastern regional director of NPFI, told the audience that "A soil test alone is not the objective of the program, but getting the farmers to use no less than the amounts of fertilizer and lime recommended is."

QUEBEC ELECTS

Jean Leclerc, chief chemist of the Montreal soils laboratory of Canadian Industries Limited, who has been elected president of Quebec Fertilizers Inc. Other officers elected at the recent annual conference of the organization were: executive director, P. E. Bastien, Canada Packers Ltd.; secretary-treasurer, Lorrimer Whitworth, International Fertilizers; chairman agronomic committee, Guy Gubbay, William Houde Ltd.; chairman advertising committee, Arthur O'Donoughue, Cyanamid of Canada Ltd.

Leclerc

Production of

Granular No-Nitrogen Grades

by R. D. YOUNG
Div. Chemical Development
Tennessee Valley Authority

In the granulation of fertilizer grades that contain nitrogen, the reaction of ammonia with superphosphates or acid plays an important part in providing conditions that are favorable to granulation. This reaction is not available as an aid to granulation of no-nitrogen grades. These grades usually are made by granulating superphosphates or mixtures of superphosphates with potash salts. In our first tests we sought to granulate these materials with water or water and steam in the continuous ammoniator drum. The granulation efficiency was fairly good, but the granules were not very strong. A high percentage of moisture was required for granulation which made the drying step difficult and expensive.

In seeking to overcome these difficulties, we tried the addition of phosphate rock and sulfuric or phosphoric acid in the formulations. This method proved to be quite beneficial; the granulation efficiency was improved, the granules were stronger, and the moisture content was so low that little or no drying was required. These improvements were attributed to the heat of reaction of phosphate rock and acid and to the plasticity of the fresh superphosphate produced in the granules. The reaction of the acid and rock was rapid and substantially complete after 1 week of curing.

Grades that have been produced in this manner are 0-14-14, 0-20-20, and 0-25-25. The phosphate rock, potash, ordinary and/or triple superphosphate, and recycled fines were fed in the usual way from belt feeders to a collecting belt which discharged into the continuous ammoniator drum. The acid was fed beneath the bed through a drilled pipe distributor containing twenty holes 3/32 inch in diameter; distribution was over about the first half of the length of the drum. When sulfuric acid was used, enough water to dilute it to about 70 per cent H_2SO_4 was fed into a mixing wye on the distributor. It was necessary to use Hastelloy B for the distributor in which the sulfuric acid was diluted. Type 316 stainless steel was satisfactory when phosphoric acid was used. Steam, when used, was fed through a slotted distributor of the type commonly used for nitrogen solutions. The proportion of the P_2O_5 supplied by the rock and acid varied from one-third to all of the phosphate in the formulation. Formulations and other data for typical tests of these grades are given in Table I. Nongranular potash was used in all of the tests.

Production of 0-14-14

This grade has been produced satisfactorily with from one-third to all of the P_2O_5 from phosphate rock. Data are given in Table 1 for tests with half and with all of the P_2O_5 from rock. Operation without steam was considered marginal because of the low temperature in the drum (140° to 160° F.) which resulted in erratic granulation and increased sticking of the material in the drum and on the discharge chutes. The use of from 50 to 100 pounds of steam per ton of product gave temperatures of 180° to 200° F. in the drum, thus improving control of granulation and over-all operation. It was necessary to use a small amount of heat on the dryer, primarily to condition the granules for screening and crushing of oversize. The burner was regulated to give a dryer discharge product temperature of 140° to 150° F. Limiting the drying temperature was necessary because drying to a moisture content below about 4 per cent resulted in decreased conversion. About 95 per cent of the P_2O_5 in the rock was converted to an available form after 1 week of curing when conditions were properly controlled.

Production of 0-20-20

The 0-20-20 grade was produced with formulations that utilized either sulfuric or phosphoric acid to acidulate rock and promote granulation. This grade ordinarily requires about 13 units of P_2O_5 from triple superphosphate (48% P_2O_5) and 7 units from ordinary superphosphate (20% P_2O_5) in order to make grade. When sulfuric acid was used, best results were obtained when all 7 units of ordinary superphosphate were produced in the drum by the reaction of rock and acid. The 13 units of triple superphosphate were fed as cured nongranular material. This formulation is shown in the first column under the 0-20-20 grade in Table 1.

Operation was reasonably good without steam but was improved considerably by the use of 50 pounds of steam per ton of product. The temperature in the drum was 136° F. without steam and 162° F. when steam was used. It was necessary to use a small amount of heat on

* Mr. Young's presentation, with the demonstration that followed, was a highlight of the TVA fertilizer technology conference at Muscle Shoals, Ala. June 10.

Table I. Pilot-Plant Formulations and Data for No-Nitrogen Grades Using Phosphate Rock and Acid

Grade	0-14-14				0-20-20		0-25-25	
Formulation, lb./ton of product								
Phosphate rock (32% P_2O_5)	438		888		458		165	235
Triple superphosphate (48% P_2O_5)	--		--		590		167	545
Ordinary superphosphate (20% P_2O_5)	720		--		--		700	--
Sulfuric acid (93% H_2SO_4)	295		590		295		--	--
Phosphoric acid (53% P_2O_5)	--		--		--		265	355
Muriate of potash (60% K_2O)	466		466		666		666	835
Water								
For dilution of sulfuric acid	100		140		75-100		--	--
For granulation	--		--				15-35	0-15
Steam	0	100	0	100	0	50	0	0 125
Recycle	400	400	1900	1900	400	400	200	400 400
Temperature, °F.								
Acidulating drum product	140	190	162	205				
Granulator product	126	172	150	188	136	162	96	90 190
Cooler product	--	--	--	--	124	150	84	88 180
Dryer product	145	150	145	145	150	86	78	80 90
Granulation efficiency, % of —6 +20 mesh								
As granulated	62	68	58	62	47	58	77	58 72
After crushing oversize	82	84	--	--	67	82	88	76 86
Product moisture, %	4.1	4.0	3.7	4.2	3.7	4.2	3.1	3.0 4.1
Net conversion of P_2O_5 in rock,* %	95	95	94	95	92	98	94	94 92

* After 7 to 14 days of curing.

Familiar face in Midwest fertilizer plants: U.S.I.'s Field Service Engineer Tom Martin checks granulation of product at Federal Fertilizer Co. plant in Danville, Ill.

Here's U.S.I.'s Tom Martin . . .

LOOKING FOR WORK IN YOUR PLANT

Tom Martin is U.S.I.'s Senior Field Service Engineer covering fertilizer manufacturers in the Midwest. His job: To help customers make the most efficient use of U.S.I.'s Ammonia, Nitrogen Solutions, Sulfuric Acid and Phosphatic Fertilizer Solutions (wet process phosphoric acid).

Tom knows materials, processes, equipment, formulations, costs. He'd like to put his knowledge and experience to work in your plant.

Why not get in touch with him? He's available for trouble shooting on any immediate production problem you may have. Tom will also help you calculate optimum formulations . . . suggest equipment . . . determine whether — and how — you can cut costs. He'll work with you setting up trial runs, and lend a hand until production is running smoothly.

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Table 2. Data for Tests in Production of 0-30-30 and 0-40-20

Grade	0-30-30	0-40-20
Production rate, tons/hr.	0.98	0.98
Formulation, lb./ton of product		
Calcium metaphosphate (64% P_2O_5)	701	1102
Phosphoric acid (78% H_3PO_4)	275	216
Calcined dolomite	83	54
Potassium chloride (61% K_2O)	990	669
Steam	255	255
Recycle	400	400
Temperature, °F.		
Reaction drum product	222	218
Granulator product	151	145
Dryer product	191	196
Screen analysis (Tyler), %		
Granulator product		
(Oversize (+6 mesh)	31.7	40.0
Onsize (—6 +20 mesh)	67.5	59.1
Undersize (—20 mesh)	0.8	0.9
Dryer product		
Oversize (+6 mesh)	10.2	32.4
Onsize (—6 +20 mesh)	77.1	58.4
Undersize (—20 mesh)	12.7	9.2
Onsize product after crushing oversize, %	84	82

the dryer (dryer product temperature of 150° F.) to allow proper screening when steam was not used. When steam was used, the drying step could be eliminated, and merely cooling the granulator product was satisfactory. Conversion of the P_2O_5 in the raw rock fed to the process was 92 to 98 per cent complete after 7 to 14 days of curing.

The most satisfactory formulation utilizing phosphoric acid for acidulation also is shown in Table 1. Best results were obtained when 9 of the 13 units of triple superphosphate needed in this grade were supplied by the reaction of rock and wet-process phosphoric acid. The 7 units of ordinary superphosphate were fed as cured commercial material. No steam was used, and a small amount of water (15 to 35 lb./ton of product) was added to assist in control of granulation. Granulation and over-all operation were surprisingly good despite the low temperature (96° F.) in the drum. The use of steam to provide a higher temperature was not tested with this formulation. A small amount of heat on the dryer (product temperature of 145° to 150° F.) was necessary to allow satisfactory screening and crushing of oversize. Only mild drying was used because past experience in drying fresh granular triple superphosphate had shown that temperatures above 160° F. result in reversion of a sizable proportion of P_2O_5 to an unavailable form.

Production of 0-25-25

Best results in the production of 0-25-25 were obtained when half of the P_2O_5 was supplied as rock and wet-process phosphoric acid and the remainder as cured triple superphosphate. When steam was not used, the temperature in the drum was only 90° F. and the material was quite sticky, causing difficulty in the drum, cooler, and screens. The use of 100 to 125 pounds of steam per ton of product increased the temperature in the drum to 190° F. and improved operation. The formulation and data for a test of this grade, with and without steam, are shown in Table 1.

In the test in which steam was used, granulation was very good; 72 per cent of the product was minus 6 plus 20 mesh before the oversize was crushed. No heat was used in the dryer, and the material screened satisfactorily. The cooled product contained 4.1 per cent moisture. The over-all availability of the P_2O_5 was 97 per cent, and the net conversion of P_2O_5 from rock was 92 per cent after 1 week of curing at room temperature.

Use of Calcium Metaphosphate in Production of 0-30-30 and 0-40-20

Calcium metaphosphate has been used commercially in dry blends with potassium chloride to produce nongranular high-analysis grades such as 0-30-30 and 0-40-20. Considerable difficulty has been reported in obtaining uniform analysis because of segregation of these materials. Granulation was considered to be a promising method for minimizing segregation and for obtaining better handling and storage properties. In exploratory tests the granulation of calcium metaphosphate and potassium chloride with steam and water was not successful. Successful granulation of 0-30-30 and 0-40-20 was obtained by feeding 6 to 8 units of P_2O_5 as phosphoric acid and neutralizing the acid with pulverized calcined dolomite. The reaction of the acid and dolomite gave additional heat and plasticity which supplemented steam in promoting granulation. The acid and steam were fed through distributors beneath the bed in the ammoniator drum, and the dolomite was fed with the other solid materials. Granular potash gave much better results than the nongranular material in producing these grades. Data for tests of the production of 0-30-30 and 0-40-20 are shown in Table 2.

A steam rate about 250 pounds per ton of product gave best results for each of the grades. A somewhat lower proportion of phosphoric acid (6 vs. 7.5 units) was satisfactory for the 0-40-20. The temperature of the reacting material in the drum was about 220° F. in each test. The granules were rather plastic and incompletely granulated as discharged from the drum but became hard and well formed after passing through the dryer. The free acid content of the products was 0.1 per cent or lower which indicated efficient neutralization of the acid with the dolomite. The granular products were completely free from caking during several days in the storage pile. These tests indicate that these grades could be produced readily in granulation plants where steam and phosphoric acid are available.

Table 3. Formulation Used in Pilot Plant Demonstration of 0-25-25 Production

Raw material	Analysis	Pounds per ton of product
Phosphate rock	32% P_2O_5	235
Phosphoric acid (wet process)	53% P_2O_5	355
Triple superphosphate	47% P_2O_5	555
Potassium chloride (nongranular)	60% K_2O	835
Steam		125
Recycled fines		400

Storage Test Data

Data were obtained to evaluate the storage properties of the 0-14-14, 0-20-20, and 0-25-25 grades produced in the pilot plant. Tests were made in six-ply bags with one or two asphalt liners. All of the products were cured for at least 1 week prior to bagging. A summary of the results of the storage tests follows. Products that were stored for 1 to 9 months without conditioning had only light to medium bag set and contained no lumps after the stand-

ard drop test. The bags usually failed when dropped, however. Coating of the granules with 2.5 per cent of a neutralizing conditioner such as Kemidol usually was effective in preventing bag attack. The cotton thread used for closure of the bags usually failed even when a conditioner was used. A specially resistant thread probably would be needed for the bags.

Bag-storage tests of the 0-30-30 and 0-40-20 grades are not yet completed; however, the appearance and low free-acid content of these products indicate that their storage properties should prove to be very satisfactory.

Corrosion Test Data

When phosphoric or sulfuric acid is used to acidulate phosphate rock in the production of no-nitrogen grades, the exhaust gases from the acidulating drum contain fluorine and hydrogen chloride. The evolution of both of these fumes is more pronounced when sulfuric acid is used because of the liberation of a higher proportion of fluorine from the rock and greater reaction of sulfuric acid with potassium chloride to liberate hydrogen chloride. Metals and protective coatings were tested for resistance to exposure in the exhaust gas from the pilot-plant acidulating drum when 0-14-14 and 0-25-25 grades were produced.

The metals tested were mild steel, Type 316 stainless steel, and 2S aluminum. Protective coatings that were tested on mild steel were Bisonite No. 900 (a furan-base coating) and Nukemite No. 33 (a vinyl copolymer resin). The time of exposure was somewhat limited, but the data obtained should give an indication of the type of material that would be suitable for hoods and ducts.

The data indicated satisfactorily low rates of corrosion for mild steel, Type 316 stainless steel, and aluminum when phosphoric acid was used. Of the metals tested, only Type 316 stainless steel appeared to be suitable when sulfuric acid was used. The Bisonite coating on mild steel cracked, but the Nukemite No. 33 coating on mild steel appeared to be satisfactorily resistant to attack when either of the acids was used. A suitable coating of this type on mild steel probably would be the best solution to this corrosion problem, particularly if sulfuric acid is used.

Demonstration of 0-25-25 Production

The production of 0-25-25 grade will be demonstrated in the pilot plant using the formulation in Table 3.

The phosphoric acid will be metered with a Rotodip type of meter and will be fed to the drum at room temperature through a ¼-inch drilled pipe containing twenty holes 3/32 inch in diameter. The distributor will be located beneath the bed in the feed half of the drum. Steam will be fed through a full-length distributor of the type commonly used for nitrogen solutions. The production rate will be 1 ton per hour. The product from the granulator will be cooled in a rotary cooler and screened at minus 6 plus 16 mesh.

Other data taken from a previous pilot-plant test with this formulation follow.

Pilot Plant Test Data

Moisture, %	
Acidulator product	4.5
Granulator product	4.0
Cooler product	3.2
Screened product	3.0
Temperature, °F.	
Ammoniator product	195
Granulator product	180
Cooler product	95
Screen analysis (Tyler) of cooler product, %	
Oversize (+6 mesh)	28
Onsize (—6 +20 mesh)	58
Undersize (—20 mesh)	14
Onsize recovery after crushing oversize, %	79
Chemical analysis, %	
Total P_2O_5	26.5
Available P_2O_5	25.6
W. S. P_2O_5	24.0
Free acid	0.8
K_2O	25.5
H_2O	3.0

Liquid Fertilizers from Superphosphoric Acid

by M. M. Striplin, Jr.
Division of Chemical Development
Tennessee Valley Authority

Phosphoric acid supply is a major problem to the liquid fertilizer industry. The industry is geared largely to the surplus furnace acid that does not find outlets in detergents and other comparatively high-priced products. The impurities in wet-process acid, which is less expensive to produce than furnace acid, are troublesome and this type acid has not been generally accepted for use in liquid fertilizers, although progress is being made in that direction as discussed in subsequent papers. Phosphoric acid plants are relatively few in number and are widely separated. Acid-resistant railroad cars are scarce and a large investment in such equipment is required to meet the demand for acid. The acid generally available as phosphatic fertilizer solution is of relatively low analysis, containing only about 55 per cent P_2O_5 (75% H_3PO_4). Hence, delivered costs of acid are high and a problem exists in providing adequate transportation and storage facilities to meet the needs for acid during the relatively short season when liquid fertilizers are in peak demand.

Another major problem in liquid fertilizer production is that the grades of solutions which can be made from ordinary phosphoric acid are not as high as those available as solid fertilizers. Also, most minor and secondary elements are quite insoluble in the usual liquid fertilizers.

TVA is utilizing its research and production facilities to help overcome some of these problems. Processes have been developed [Striplin, M. M., Jr., McKnight, David, and Megar, G. H. J. Agr. Food Chem. 6, 298-303 (1958)] for the production and utilization of superphosphoric acid that contains 76 per cent P_2O_5, equivalent to 105 per cent H_3PO_4. A given volume of this acid contains 70 per cent more P_2O_5 by weight than acid of ordinary concentration, thereby providing for the transportation and storage of considerably more plant food in existing equipment. Also, solutions of ammoniated superphosphoric acid contain polyphosphates in addition to the orthophosphate present in liquids produced from ordinary acid. As a result it is possible to produce liquid fertilizers of higher analyses, or, conversely, with lower salting out temperatures. Significant amounts of minor elements may be dissolved in liquid fertilizers that contain polyphosphates, whereas such is not true in the case of liquids produced from ordinary acid. When wet-process acid is ammoniated in the presence of superphosphoric acid or ammoniated superphosphoric acid, the polyphosphates serve to sequester the impurities in the wet-process acid and liquid fertilizers free of precipitated solids are obtained.

* Mr. Striplin's presentation, and the demonstration that followed, was a highlight of the TVA liquid fertilizer conference July 11 at Muscle Shoals, Ala.

Grades, Salting Out Temperatures, and Formulations

When ordinary acid (75% H_3PO_4) is ammoniated to produce an essentially neutral solution, liquid of 8-24-0 grade is the most concentrated that will not salt out when stored at 32° F. With superphosphoric acid a solution of approximately 11-33-0 grade may be produced which will store satisfactorily at 32° F. Other materials such as urea, potassium chloride, and nitrogen solutions may be added during production of the 11-33-0—or to the cold 11-33-0 base solution later—to give liquid mixes. The following tabulation shows some of the grades obtainable with 11-33-0 solution and data on how they compare with those obtained with 8-24-0 solution made from ordinary acid. The liquids made from superphosphoric acid contain from 11 per cent to 47 per cent more plant food.

Liquids of the same grades salt out at lower temperatures when produced from superphosphoric acid instead of from ordinary acid. For example, in the case of a 7-21-7 solution, the salting out temperature was 55° F. lower with superphosphoric acid. For 10-10-10 and 8-16-8 solutions in which the supplemental nitrogen was supplied as urea, the lowerings were 15° and 23° F., respectively.

It is possible to economize on the supplemental nitrogen cost in some grades with superphosphoric acid. For example, 10-10-10 liquid produced from ordinary acid with the supplemental nitrogen supplied as solid urea salts out at about 60° F. This grade with the same salting out temperature can be made with superphosphoric acid and urea—ammonium nitrate solution, which is less expensive than solid urea.

Some typical formulations for the production of liquid fertilizers from superphosphoric acid and other materials, with salting out temperatures of the products, are given as follows.

Ratio	Additional nitrogen supplied as	Max. grade stable at 32° F. or indicated temp. Base solution 8-24-0	Base solution 11-33-0
1:1:1	Urea - ammonium nitrate	7-7-7	8-8-8
1:2:1	solution[1]	7-14-7	8-16-8
1:1:1	Ammonium nitrate	5-5-5	6-6-6
1:2:1		5-10-5	7-14-7
1:1:1	Urea	9-9-9	10-10-10[2]
1:2:1		7-14-7	8-16-8
1:3:1	None	6-18-6	7-21-7
1:3:2		4-12-8	5-15-10[3]

[1] Solution contained 38.8 per cent ammonium nitrate and 31.0 per cent urea.
[2] Crystals appeared at 41° F. and dissolved at 47° F.
[3] Crystals appeared at 36° F. and dissolved at 40° F.

Minor and Secondary Elements

The inability of liquid fertilizers produced from ordinary acid to hold in solution appreciable amounts of sulfur compounds and minor elements has been a handicap in some areas. From about 50 to several hundred per cent of the minor elements normally applied to correct deficiencies in soils may be dissolved individually in liquid fertilizers produced from superphosphoric acid, as borax or the sulfates of iron, zinc, and copper. Manganese sulfate is not soluble enough to be of value. A 9-9-9 liquid produced from superphosphoric acid and containing 8 parts sulfur as ammonium sulfite per 100 parts P_2O_5 stored satisfactorily at 32° F.

Method of Operation

The operating procedures for the use of superphosphoric acid in standard liquid fertilizer plants are not greatly different than for the use of ordinary acid. Generally speaking, the acid should be used at full strength and should be added with ammonia to neutral solution in the reactor rather than to water. If the acid is added to water initially the beneficial effects of the polyphosphates are lost through hydrolysis. Successful operating procedures for most plants of standard design have been developed and used commercially.

Superphosphoric acid of 76 per cent P_2O_5 content, although liquid at room temperature, is more viscous than ordinary phosphoric acid and may develop crystals on long storage in cold weather. It may be desirable, where practicable, to ammoniate the acid as it is received. Inside storage, buried tanks, or heated tanks may be desirable in cold climates.

Grade	Formulation, lb./ton: 11-33-0 (10.8-33-0)	28% N solution[1]	Urea (46% N)	KCl (62% K_2O)	H_2O	Approx. salting out temperature, °F.
7-21-7	1273	9	--	226	492	12
5-15-10	909	7	--	323	759	36
5-10-10	606	123	--	323	948	20
8-16-8	968	196	--	258	578	<32
12-12-6	727	577	--	194	503	61
14-14-7	848	--	409	226	516	14
9-9-9	545	433	--	290	741	50
9-9-9	545	--	263	290	901	12
8-8-8	485	492	--	258	766	34

[1] Solution contained 38.8 per cent ammonium nitrate and 31.0 per cent urea.

Production and Use of the Acid

Several thousand tons of superphosphoric acid have been produced by TVA in the last 12 months and used in the production of solid and liquid fertilizers. Both the acid and the ammoniated material (11-33-0 solution) have been distributed to the fertilizer industry to demonstrate the advantages of these materials and to develop markets for them which industry may find sufficiently attractive to justify undertaking production of the acid. Commercial production of the acid has been started in Canada and at least one company has announced plans for production of the acid in the United States. Others have made successful trial runs during which the acid was produced.

This is the second season for production of high-analysis liquid fertilizers from superphosphoric acid. Several companies are using the acid either to produce high-analysis solutions or as a sequestrant for wet-process acid. In addition, use of 11-33-0 as a base solution, which began this season, appears to be finding good acceptance.

TVA distributes the acid and 11-33-0 solution under short form contracts which limit the amounts to 500 tons of each material to a company per fiscal year. Rail shipments of the solution are being made, but shipments of the acid have been entirely by truck pending the outcome of negotiations for a rail rate in this area. Rail rates for shipment of the acid at the same cost per ton as for ordinary acid have been published for the Western Trunk Line Territory. Where the rate is the same for both acids, the savings in freight amounts to about 30 per cent on a P_2O_5 weight basis. This savings is sufficient to make important reduction in the delivered cost of acid for an average haul.

Regional Fertilizer Safety Schools

Accident frequency in fertilizer plants is double those of similar industries. With financial backing and cooperation from the National Plant Food Institute, the National Safety Council has established five regional Fertilizer Safety Schools in the United States. All fertilizer manufacturers are urged to send production managers, safety supervisors, plant superintendents, foremen, or anyone connected with responsibility to one of the schools.

Records show that a safety program carried on through sincere participation, can easily cut accidents in half. With the personalized instruction that is to be given, a supervisor cannot help but return to his work with the conviction that safety is a part of his job. He can then be influential in drastically reducing accidents and thereby lower operating costs, reduce insurance premiums, and improve employee morale.

To accomplish effective instruction, some of the top safety educators in the country have been engaged. Such subjects as "The Leadership and Responsibility for Establishing an Effective Safety Program"; "The Principal Unsafe Acts Leading to Accident;" "Safety Education and Fundamentals"; and "The Handling of Liquid Materials in the Fertilizer Mixing Program," are but a few of the many which will be thoroughly discussed.

This is an opportunity no fertilizer manufacturer should let slip by.

ATTEND!

SOMEONE from your firm should be at the Fertilizer Safety Section—NPFI safety school to be held in your region this year. (You needn't be an NPFI member to attend.) Attendance will sharpen his interest and give him more know-how in improving or maintaining your plant's record. And a good safety program builds prestige in your community, adds to public and employee relations, assures more efficient operation . . . and pays big dividends in reducing insurance premiums.

GET BUSY right now with plans to send one or more men. Registration fee is only $20 per person (checks payable to National Plant Food Institute) and includes two luncheons and all instructional material. Advance registration and check should be sent to the director of the school in your region, and room reservations made direct with the hotel. Here are the locations, dates and directors:

NORTHEAST Regional School: Cornell Univ., Ithaca, N. Y., Aug. 12-13; Stratton McCargo, G.L.F. Soil Building Service, Terrace Hill, Ithaca.

SOUTHEAST Regional School: Heart of Atlanta Motel, Atlanta, Ga., Aug. 27-28; Quentin S. Lee, Cotton Producers Assn., P. O. Box 2210, Atlanta 1.

MIDWEST Regional School: Safety Council Hdq., Chicago, Aug. 18-19; John E. Smith, Spencer Chemical Co., P. O. Box 604, Pittsburg, Kans.

SOUTHWEST Regional School: Tropicana Motor Hotel, Pasadena, Texas; Nov. 12-13; Ansel I. Raney, Phillips Chemical Co., Adams Bldg., Bartlesville, Okla.

FAR WEST Regional School: Hacienda Motel, Fresno, Calif., Nov. 5-6; O. J. Chinnock, Hercules Powder Co., Hercules, Calif.

Regional Schools Inaugurated in '58

History of the regional accident prevention schools sponsored by NPFI and the Fertilizer Section, National Safety Council, dates back to 1958 when the program was inaugurated.

Comments from participants at last year's sessions generally were complimentary. They include the following:

". . . consider it (school) very well worth time and effort spent."

". . . excellent meeting, you'd better sell this to top management."

". . . very good—showed the magnitude of what can be done."

". . . top notch speakers."

". . . I feel the school should include top management representation."

". . . very well planned and well presented."

". . . my time was well spent."

". . . all subjects were valuable to me."

". . . time allotted for each subject induced clarification of subjects and understanding by students."

". . . subjects were selected to give good coverage of safety problems in most plants."

". . . the teachers did an excellent job."

". . . very businesslike and well organized."

". . . program was planned to perfection."

Fertilizer Industry Holds Poor Position In Injury Rates

The fertilizer industry, which had anything but an enviable record in its injury-frequency rate per million man-hours during the first quarter of 1958, dropped further down the ladder in the initial quarter of 1959. Statistics show that the fertilizer industry's rate jumped from 12.4 in early 1958 to 15.0 during the same period in 1959, ranking twelfth among the 13 sections of the chemical industry.

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RATES: single issue, 8c per word; two issues, 12c per word; three issues, 15c per word: add 4c per word for each insertion beyond three issues. 'For Sale', 'Exchange' and 'Wanted' advertisements accepted for this column must be **paid in advance.**

HELP WANTED

SUPERVISORS for shift supervision in dry fertilizer section of an integrated fertilizer plant located in Central California near medium sized city. Experience in wet-process phosphoric acid and pelleted ammo-phos based fertilizers essential. Will consider top operators with good education, background, and experience. Send full details first time including salary requirements, present salary, and availability. Box 25, % Commercial Fertilizer, 75 - 3rd St., N. W., Atlanta 8, Georgia.

FERTILIZER PLANT WORKING FOREMAN. Take full charge small plant, control of production, mixing, shipping, etc.; complete plant maintenance. Salary commensurate with experience. Plant located in Central Atlantic state. Box # 26, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

WANTED SALES EXECUTIVE

Responsible sales position. Challenging opportunity for imaginative, aggressive agri-chemical graduate with experience in chemical sales. Position involves administration and sales with a progressive, fast-growing midwest manufacturer of liquid fertilizer, insecticides, and herbicides. Mail resume in strict confidence to Box # 22, % Commercial Fertilizer and Plant Food Industry, 75 Third St. N. W., Atlanta 8, Ga.

SALESMEN to handle a side line of Dust Masks, Goggles, First Aid Kits, on an exclusive basis. Old Established house. Write advising territory covered. General Scientific Equipment Co., Philadelphia 50, Pa.

PLANTS FOR SALE

FOR SALE: Part interest in progressive, well-established fertilizer plant in business for past 12 years. In rich farming section of North Mississippi. Owner wishes to semi-retire and take in younger man as partner. Write Box # 21, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

POSITION WANTED

WANTED: Position as Plant Manager or Superintendent of fertilizer plant. Have been continuously employed for 25 years in fertilizer production. Am forty-three years of age, married, have three children. Twenty-five years experience as plant manager and production manager in the production of fertilizers and phosphates. Have supervised the building of 3 complete plants, as well as installing 5 granulating units, and operating the same. Am familiar with formulating and all phases of fertilizer production, both normal and triple phosphate. Have lived in the South all my life and would prefer to locate in Florida or some southern state. Can furnish references if required. Reply Box 27, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Ga.

DESIRE TO RELOCATE IN SOUTH EAST: Over 12 years experience with same firm in sales and sales management of fertilizer and pesticide basic ingredients. Presently employed Assistant Management position administrating sales and activities of over 50 people. Present volume of around 20 million. Compensation commensurate with performance. Reply Box # 28, % Commercial Fertilizer and Plant Food Industry, 75 - 3rd St., N. W., Atlanta 8, Ga.

AVAILABLE—Fertilizer Plant Layout and Design Engineer. Box # 29, % Commercial Fertilizer, 75 3rd St., N. W., Atlanta 8, Ga.

USED EQUIPMENT FOR SALE

CLOSE-OUT OF USED EQUIPMENT: Troughing Idler, Flight, Bag, Package and Portable Conveyors; Crushers, Vibrating Screens, Feeders, Bins, Motors, and other equipment. All rebuilt and guaranteed. Write for free Catalog and price list. Bonded Scale and Machine Company, 2189 South Third Street, Columbus 7, Ohio. Phone: HIckory 4-2186.

FOR SALE: Complete granular fertilizer plant including dryers, pulverizers, bagging equipment, etc. Aluminum Tanks, 18,000, 3,000 gal. Dewatering presses, Davenport #1A, #2A, #3A, Louisville 8-roll 36". Louisville Rotary Steam Tube Dryers, 6' x 50'. Screw Conveyor, Trough Belt Conveyor, Bucket Elevator, Bins, etc. Perry Equipment Corp., 1426 N. 6th St., Philadelphia 22, Pa.

FOR SALE: 2-7'6" x 55' and 80" x 65' Rotary Dryers, 3 - Louisville 6" x 50' Rotary Steam Tube Dryers, also Mixers, Storage Tanks, Screens, Elevators. Send us your inquiries. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

FOR SALE—1 New Stedman Type BX 20 x 18 Hammermill equipped with 4 row rotor with ⅞" manganese hammers and complete with 220V reduced voltage type compensator. Mill direct connected to 20 HP, 1200 RPM, 220/440 Volt, 3 Phase, 60 Cycle Totally Enclosed Fan Cooled Motor. Mill and motor mounted on integral base. Box # 20, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Georgia.

INDEX TO ADVERTISERS

STATE NEWS . . . . .

GEORGIA tonnage for the 1958-59 year topped the '57-58 figures by 211,602 tons, being a 17% increase to 1,425,749 tons for the year just completed.

LOUISIANA reports a tonnage gain of 46,304 for the nine months ending May 31. The state's fertilizer year, running September 1-August 31, tallied 251,232 tons during the initial three quarters. Sales slowed down in June, however, with figures for that month running 5363 tons behind the same month last year.

NORTH CAROLINA also registered a substantial increase through the first eleven months of its fertilizer year. The July 1-May 31 figure of 1,601,046 this year is 253,999 tons ahead of the same period last year. New provisions of the N.C. fertilizer law, amended just this year, bring simultaneous application of two or more fertilizer materials under the legal definition of mixed fertilizers, and bring fertilizer 'contractors' under regulations similar to those for fertilizer manufacturers. Under the amended law, both manufacturers and contractors are required to obtain a license.

SOUTH CAROLINA's 1958-59 tonnage of 890,302 topped the preceding crop year by 157,695 tons, an increase of 21.5%.

Bulk distribution accounted for 53,898 tons of the state's 890,302 tons for 1958-59. 13,799 tons of mixed goods and 40,099 tons of straight materials moved in bulk form.

Six grades accounted for 78% of the year's tonnage. 4-12-12 led with 24.8 percent of the total; 4-10-6 was next best seller at 19.5%, and 3-12-12 amounted to 11.3%; the other three were: 4-8-12, 9.2%; 3-9-9 (tobacco only), 7.6%; and 5-10-10, 5.6%.

The Fertilizer Board of Control has also authorized each registrant to have one additional specialty grade, making a total of two allowable specialty grades which do not have to conform to the agricultural ratio and minimum analysis list, provided the second specialty grade is not sold in packages weighing more than 25 pounds. Full details on the new ruling are available through the state control office at Clemson.

TEXAS showed a slight decrease to a total of 664,651 tons for the year ending June 30. This is barely below the 666,128 tons for the 1957-58 year. An increase of 9556 tons in sales of mixed goods for the year was offset by a decline of 11,043 tons in sales of direct-application materials.

WYOMING reports a total of 13,079 tons of fertilizers for the 1958 calendar year, compared with 10,236 tons in 1957 and only 8430 tons in 1954. Some 23% of the tonnage for 1958 moved as mixed goods; phosphate materials accounted for nearly 35%, nitrogen materials for more than 42%.

obituaries

Gilbert Hilsman Alfriend, former V-C traffic manager, retired in 1956, at his home in Richmond, Va. He has been teaching at the University of Virginia.

Nathan Manley Johnson, Sr., 68, founder of Johnson Cotton Co., operating plants at Wilmington and Dunn, N. C. died in an automobile crash June 30.

CF Staff—Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperative State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

	June		May		April		Jan.-Mar. Qtr.		July-December		YEAR (July-June)	
STATE	**1959**	**1958**	**1959**	**1958**	**1959**	**1958**	**1959**	**1958**	**1958**	**1957**	**1957-58**	**1956-57**
Alabama	-------	64,827*	165,927	158,660	313,727	263,953	296,745	246,637	199,265	172,721	906,783	983,614
Arkansas	37,569	30,048	42,602	31,301	95,420	89,621	113,772	75,919	64,092	62,752	289,641	325,150
Georgia	231,074	233,786	471,260	302,211	253,371	262,313	175,273	146,308	294,751	269,529	1,214,417	1,234,383
Kentucky	-------	40,544*	150,782	150,713	130,518	99,166	176,106	139,541	98,504	88,771	523,794	534,391
Louisiana	21,173	26,536	45,057	37,969	56,162	56,239	79,260	67,665	64,152	64,192	296,935	271,406
Missouri	-------	48,925*	155,893	151,067	175,215	133,859	165,375	79,445	370,036	335,312	755,927	791,830
N. Carolina	-------	114,084*	282,240	295,452	464,818	414,140	625,933	438,009	228,055	199,466	1,461,131	1,516,587
Oklahoma	8,627	6,055	14,374	13,983	15,936	15,766	25,801	20,160	68,848	51,436	107,400	107,345
S. Carolina	47,518	53,663	102,425	102,787	220,685	172,505	385,472	286,778	134,202	116,874	732,607	817,500
Tennessee	-------	44,938*	112,907	112,462	151,177	65,668	150,897	84,114	127,116	135,717	442,889	524,638
Texas	49,904	77,191	83,994	90,118	98,651	100,423	203,084	163,525	222,800	213,801	666,128	595,176
California	(reports compiled quarterly)						317,589	253,545	450,767	441,969	1,123,235	1,079,748
Oregon	(reports compiled quarterly)						-------	-------	50,176	44,793	177,304	201,073
Virginia	(reports compiled quarterly)						315,665	218,551	160,178	140,783	690,556	754,233
Indiana	(reports compiled semi-annually)								316,260	284,959	1,080,465	1,087,185
New Hampshire	(reports compiled semi-annually)								4,746	3,996	20,019	18,983
Washington	(reports compiled semi-annually)								75,350	77,498	235,784	165,951
TOTAL	**395,865**	**427,279**	**1,627,461**	**1,446,993**	**1,975,680**	**1,673,653**	**3,030,972**	**2,220,197**	**2,830,794**	**2,708,565**	**10,725,015**	**11,009,193**

------- (not yet reported) * Omitted from column total to allow comparison with same period of current year.

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